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NOTICES:—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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The Latent Genius of Our Countrymen

IN the matter of interest and variety it may be said that the proceedings of the British Association are unrivalled in this country. This year's meeting at Bournemouth, the first for two years, will rank as one of the most important ever held, in that it has provided the first real opportunity for the unbridled discussion of the miracles in science, in engineering, and in other directions which stand as a monument to the latent genius of our countrymen. During the war period credit could not be given to that select army of thinkers who were fighting out victory in the laboratory and workshop. Vague impressions were gained of the wonders which were wrought by their perseverance; but the exigencies of the situation and the need for secrecy demanded that they should perform their task with no thought of notoriety. Naturally, our attention is claimed in the first place by those men of science who, with intense zeal, devoted themselves to the retrieval of the almost irreparable negligence of the past, and who, in an incomparably short space of time, redeemed the mistakes of half a century. As time, under the circumstances, was "the essence of the contract," work had, perforce, to be directed primarily to the application of known principles, rather than to the making of new and laborious discoveries; although—as Sir Charles Parsons says—in effecting such applications, inventions of a high order have been achieved, some of which promise to be of great utility in times of peace. Energy has, unfortunately, largely been turned in destructive directions, but the principles evolved, and the knowledge gained, will be of immense help in formulating the constructive plans with which we are now face to face. Callous though it may seem, it is, nevertheless, a palpable fact that as a nation the war has left us many things for which we must be thankful. Had the events of the last five years never occurred, we might even yet be drifting along that road of apathy which would surely have sounded the knell of our national supremacy. When, however, we take to heart the lessons contained in the addresses of Sir Charles Parsons, Sir William Pope, and others, we can at least feel a sense of gratification at the strides which have been made, and we can regard with pride the new vista which is opened up in that particular branch of industry which we aspire to represent.

At the moment many are suffering disappointment from the fact that manufacturers are rather too ready with the plea that they cannot consider further work for some time to come, owing to the surfeit of orders in hand. This, no doubt, is an encouraging sign, but it is to be trusted that the disorganisation it causes will not last for long, and that any necessary extensions will be quickly completed.

British Association's Fuel Report

PERHAPS, to the average industrial chemist, the most interesting feature of the British Association's meeting was the report of the committee instituted for the investigation of fuel economy, and the proper means of utilising coal. This committee is presided over by Professor Bone, whose work in connection with the problem is well known, and the figures which we give in our abstract of the report elsewhere are sufficiently convincing to bring home to us the fact that we are surely being outstripped by other nations, notably America. That a cheap and plentiful supply of coal is of vital importance to the nation's industrial prosperity is an accepted truism, but it would seem that certain sections of the workers are quite content to go on regarding it as a well-worn platitude. Probably the awakening will not come until we are faced with the distress which must inevitably follow our inability to maintain that past

supremacy which we have enjoyed in the iron, steel, engineering, shipbuilding, and textile industries—followed, of course, by a decline in our shipping trade and sea power. Just prior to the war, moreover, we exported nearly 100 million tons of coal per annum, whereas, at the present rate of retrogression, it looks as if our annual output is going to fall off by very much more than this quantity alone. It does not require very much effort to fix the blame for the present state of affairs, for we have only to examine the output per person employed in the mining industry over the past few years. For instance, for the decade ending in 1892 the output per worker amounted to 320 tons per annum; but since then, and more particularly during the war, the figure has continued to fall at an alarming rate, so that in 1918 it had receded to 232 tons. This, however, is by no means the low water mark, and when the statistics for the current year are available they will undoubtedly show that the quantity is well below 200 tons. In marked contrast, the American figures have continued to rise from some 680 tons per worker in 1913 to the phenomenal record of 768 tons in 1917. The result is not difficult to divine. To quote the words of the committee, it appears that already American fuel prices have fallen to levels considerably below those ruling in this country, a circumstance which gives American manufacturers a great initial advantage over our own.

While speaking of the report it may be mentioned that it contains information well worth attention in connection with the chemistry of coal and the vexed problem of determining upon a specification for a standard town's gas which shall be satisfactory to all three interests concerned—namely, producers, consumers, and proprietors. The Committee's recommendations with regard to gas supply follow very much on the same lines as the Fuel Research Board's suggestions, except that it is proposed to ensure the maintenance of 20 per cent. of methane, while recognition is not given to any mixture having a calorific power lower than 450 B.Th.U. per cubic foot. Perhaps many will agree that for most domestic purposes the limitations suggested are reasonable enough, but it has yet to be shown that the hosts of *industrial* consumers of gas are going to profit by the provision of a high-quality product. Bearing in mind the extended use of blue-water gas in the chemical and industrial works of Germany, we are inclined to think that there certainly is such a thing as the gas supply being unnecessarily good for the purpose.

Professor Jevons' Scheme

When Professor H. S. Jevons talks about coal everybody is ready to listen to him, and in view of what we have said above it is particularly interesting to study a scheme for dealing with the mines which he outlined in a recent issue of the *Daily Mail*. Necessarily, as he is writing for the million, he is careful to abstain from viewing the subject from too technical a standpoint, but nevertheless he brings forward some fairly telling arguments in support of a policy which is, to say the least of it, somewhat unpopular amongst the thinking section of the population. The professor heads his article, "Nationalise Coal," and goes on to explain that it is quite evident that some solution will have to be found which is satisfactory to the miners, who firmly believe that their conditions can only be bettered by abolishing private ownership. He believes that the correct policy is to eliminate the distribution of profits to private capitalists altogether, and so to arrange that whatever profits are earned shall be distributed to the various workers in the industry, from the lowest grades up to the managers. To carry out the scheme it is suggested that public trusts should be formed for each coalfield on the lines of the harbour trusts, such trusts being bodies incorporated by Act of Parliament, with the power of issuing loan stock at fixed rates of interest, but carrying no right to a share in the profits. The financial operation connected with the formation of the trust would amount, as far as possible, merely to an exchange of securities. The trust stock, for the present, would have to carry 6 per cent. interest. The shareholders of all colliery companies within the coalfield for which a trust was being formed would be requested to exchange their shares for stock at the market valuation of their shares at some recent prior date. Those who refused such requests should be bought out in cash, or with Government stock, at a price slightly less than the market valuation, so as to induce them to accept the change. In this way the depreciation of the English public debt by further enormous issues might be avoided, yet present shareholders in colliery companies would be *quite fairly* treated.

Once the trust was constituted for a coalfield, it would take over the whole of the collieries as going concerns. It would begin at once to effect such physical rearrangements as seemed desirable, such as rearranging boundaries between mines, arranging joint ventilation and pumping schemes and new plans of haulage, wherever economies could be thus effected. These economies would probably be considerable. The scheme certainly looks very much like co-partnership dressed up in different guise, the main difference being that the shareholders appear to be precluded from benefiting during prosperous times, while they are called upon to share in the adversities. The professor does not explain very clearly where his point of "nationalisation," as it is generally understood, comes in; but if he really has this in mind, we might draw his attention to the remarks of an American, Mr. C. A. Eaton, who has recently been writing on the subject in the *Times*. Mr. Eaton sums up his views with the statement that one of the gravest delusions that ever darkened the mind of man is the theory that you can work the institutions of industry by means of a political machine.

The True Value of the Chemist

A minor but none the less important feature of the report issued by the Chief Inspector under the Alkali Acts (of which report we gave a summary in our issue for the 2nd ult.) is the mention which is made of the increasing tendency of those in authority in our chemical undertakings to employ an efficient staff of trained chemists. For instance, in his individual report, Dr. Fryer, one of the district inspectors, refers to a movement towards the formation of a central laboratory for the consideration of problems connected with the tinplate industry in South Wales, while Dr. Lewis

Bailey calls attention to the more extended employment of chemists in the chemical works. This, as Dr. Bailey says, is a hopeful sign, particularly when it is remembered that attempts at persuasion in this respect in past years were accorded comparatively little notice. At any rate, it can be said that the war resulted in an appreciation of the fact that although any particular works may be run with the help of the ordinary routine tester, it is impossible to strike out in new directions without the aid of the methodically trained research chemist. Business heads in the past have been wont to disparage the university man, for the simple reason that he is frequently taken from his academic atmosphere and is expected to drop immediately into the intricacies of practical processes of which he has but little working experience. The majority of our trained chemists—who are just as ambitious as any other section of individuals—possess the correct faculties for making good, and, once familiar with the general *modus operandi* of the works on which they are placed, they will be able to adapt themselves to questions of time-saving and shortened or rapid methods, coupled with the degree of accuracy desired for the end in view. It is, in fact, only after reasonable time for indulgence in a "preliminary canter" that they can be expected to appreciate the evolution of technical methods necessary for the control of the results of manufacturing operations. Individuals, of course, differ considerably, and it must not be assumed that the expert research chemist is capable, in all cases, of being led on from the laboratory to the position of works' manager. The latter post requires an additional quality, namely, the ability to lead men, which more often than not is innate, and not acquired. Dr. Bailey sums up the mistakes of the past in an admirable manner when he says that "in the immediate past the idea of progressiveness has been left too much to others; the attempt to stay where we were and work ever on old and stereotyped lines has been well-nigh disastrous."

Trade Returns

Our trade returns for the past month are again encouraging. Imports, while still very high, are £4,000,000 less than in July; exports show an increase of £9,400,000, and there is an excess of £3,500,000 in the re-exports over the July total. Compared with August of last year imports advanced by £38,653,000, equal to 35 per cent., while the total value of exports (British and foreign goods) rose by £44,285,000, equal to 56.9 per cent.

The adverse balance of trade for the month was 58¾ millions, against 64¼ millions in August, 1918, and 76 millions in July last, and for the eight months 461 millions, as compared with 516¼ millions in 1918 and 284½ millions in 1917. The following table shows the value of imports and exports for the month and for the eight months ended August, together with the increases as compared with the corresponding periods of 1918:—

August, 1919.

		An increase of
Imports	£148,832,393	35.0 per cent.
Exports	£74,773,278	71.8 ,,
Re-exports ...	£15,311,244	572.3 ,,

Eight Months ended August, 1919.

		An increase of
Imports	£1,018,334,779	16.7 per cent.
Exports	£474,843,957	42.1 ,,
Re-exports ...	£82,503,797	291.4 ,,

It will be noticed that though our imports for August have decreased £4,000,000 they still exceed our exports and re-exports by £58,747,871.

Chemical Industry in Canada

In reviewing the remarkable growth of the chemical industry during the war, one is apt to overlook the progress which has been achieved in Canada. During the war no one had the time or inclination to prepare accurate statistics, apart from the fact that the censor would probably have blue-pencilled any such information which might have been prepared for publication. Now, however, there is no longer any need for secrecy, and the figures which appear in a report of what Canada has done, and which have been compiled by Mr. S. J. Cook, of the Department of Trade and Commerce, provide some interesting reading. At the beginning of the present year there were 634 plants which were operated by nearly 500 Canadian firms. It is, however, the export figures which are the most telling, for it is to be noted that, as compared with 1912, the value of the chemical products exported increased by no less than 920 per cent.

Probably the most conspicuous development in Canada was the erection of the world's largest glacial acetic acid plant, built for war purposes at Shawinigan, Quebec, where an entirely new process, beginning with acetylene, was carried out. Acetone, paraldehyde, crotonaldehyde, mercuric oxide, and manganese acetate are also produced, while magnesium, of a purity ranging from 99 per cent. to 99.9 per cent., is made electrolytically from its fused salts. At Niagara Falls there has been an adaption to the manufacture of fixed atmospheric nitrogen as cyanamide, the lime-nitrogen fertiliser, and its conversion into ammonium salts. Among electric-furnace products which are native to Niagara and Shawinigan are aluminous abrasives, ferro-silicon, etc. As Mr. Cook says, it is in connection with the utilisation of Canada's water power that the most spectacular development has taken place, but progress does not depend upon that factor entirely.

In the manufacture of munitions of war there arose a demand for acetic acid and acetone which stimulated the wood distillation industries of the country, with the result that not only was the output of these products greatly increased, but acetic anhydride, methyl acetate, and special grades of acetone-alcohol and acetone oils were added to the list of products.

At the moment Canada has some hopes of building up a coal-tar dye industry. She has already embarked upon the manufacture of synthetic drugs such as aspirin, and is now producing coumarin, benzoic acid, and benzaldehyde. New acid plants have sprung up, and the facilities for producing oleum and the commoner acids have immensely increased. The activities mentioned by no means complete the list, and now it is to be trusted that the country will be able to profit by her war enterprise and find a peace-time outlet for all of her products.

The British Association

Special Report of the Bournemouth Meeting

The eighty-seventh annual meeting of the British Association opened at Bournemouth on Tuesday, and continued for the remainder of the week. On the opening day the twelve sectional presidents delivered their addresses to the twelve groups into which the members divided, and in the evening of the same day the incoming President, Sir Charles Parsons, K.C.B., F.R.S., gave his address before a crowded meeting. Nearly 1,400 members attended during the week, and the programme, as is customary, was notable for the variety of subjects which it covered, the discussions ranging from education to Jurassic reptiles. On this occasion, however, chief attention was given to subjects relating to the war, and to the reorganisation which scientific men mean to take a large share in directing. Needless to say, we propose dealing only with those portions of the Conference which are of immediate interest to our readers. Our present report carries the proceedings up to Wednesday evening.

At the Inaugural Meeting which was held at 8.30 p.m. in the Winter Pavilion, Sir Arthur Evans, the retiring President, announced that it was proposed to present an address to the King. The text of the address was as follows :—

Your Majesty,—On the occasion of the outbreak of the great war we, the members of the British Association for the Advancement of Science at that time assembled in our 85th Congress, gave an unanimous expression to our devoted loyalty to your Majesty's person, which your Majesty was graciously pleased to acknowledge.

To-day, once more assembled in our 87th Congress, it is our heartfelt desire, on the victorious conclusion of the war and the formal proclamation of peace, to renew those assurances, and to express in more than a formal manner our high sense of the example of self-sacrificing devotion to the service of the country that has been so simply offered by your Majesty throughout this long and arduous struggle.

We are painfully aware, indeed, that, in spite of the decision in the field, the period of stress is by no means over. We cannot, from our special point of view, be blind to the extent to which the bitter emergencies of war-time have been prejudicial to those ideas and methods which it is our mission to promote. But in the not less arduous struggle that lies before us to regain the stable paths of peace we are heartened by the knowledge that the same wise and conciliating influence and high example that was of such sovran help to the British people in war-time will still be with them.

A vote of thanks was then passed to Sir Arthur Evans, who had been President of the Association since the Newcastle meeting in 1916.

Sir Arthur Evans, in the course of his reply, mentioned the death of several prominent members of the Association, and mentioned in particular Lord Rayleigh, Sir William Crookes, Professor Carey Foster and Professor Vernon Harcourt.

Presidential Address

Science in War and Peace

The Presidential Address was then delivered by the Hon. Charles A. Parsons, who, in the course of his remarks, said that three years of anxiety and stress have passed since the last meeting of the British Association. The weight of the struggle, which pressed heavily upon us at the time of the Newcastle meeting in 1916, had increased so much in intensity by the spring of 1917 that the Council, after consultation with the local committee at Bournemouth, finally decided to cancel the summer meeting of that year. This was the first time in the history of the Association that an annual meeting was not held.

We are gathered together at a time when, after a great upheaval, the elemental conditions of organisation of the world are still in flux, and we have to consider how to influence and mould the recrystallisation of these elements into the best forms and most economic rearrangements for the benefit of civilisation. That the British Association is capable of exerting a great influence in guiding the nation towards advancement in the sciences and arts in the most general sense there can be no question, and of this we may be assured by a study of its proceedings in conjunction with the history of contemporary progress. Although the British Association cannot claim any paramount prerogative in this good work, yet it can certainly claim to provide a free arena for discussion where in the past new theories in science, new propositions for beneficial change, new suggestions for casting aside fetters to the advancement in science, art, and economics have first seen the light of publication and discussion.

For more than half a century it has pleaded strongly for the advancement of science and its application to the arts, and it has, since its commencement, paid out of its own funds upwards of £80,000 in grants.

Gaseous Explosions

Among other important pre-war developments, mention should be made of the discovery and extensive use of alloys of steel. The wonderful properties conferred upon steel by the addition of tungsten were discovered by Mushet in 1868, and later this alloy was investigated and improved by Maunsel White and Taylor, of Philadelphia. Tungsten steel has revolutionised the design of machine tools, and has increased the output on heavy munition work by 100 per cent., and in ordinary engineering by 50 per cent. The alloys of steel and manganese, with which Sir Robert Hadfield's name is associated, have proved of utility in immensely increasing the durability of railway and tramway points and crossings, and for the hard teeth of machinery for the crushing of stone, ores, and other materials.

Brief reference must also be made to the important work of one of the committees of the British Association appointed in 1908, under the chairmanship of the late Sir William Preece, for the investigation of gaseous explosions, with special reference to temperature. One investigation in particular has proved to be a guiding star to the designers and manufacturers of internal combustion engines in this country. The members of the committee more directly associated with this were Sir Dugald Clerk, Professor Callendar, and the late Professor Bertram Hopkinson. It showed that the intensity of the heat radiated by the incandescent gases to the walls of the cylinder of a gas engine increases with the size of the cylinder. The intensity was also shown to increase rapidly with the richness of the gas. It suffices now to say that the heat in a large cylinder with a rich explosive mixture is so intense that the metal eventually cracks. The investigation shows why this occurs, and by doing so has saved enormous sums to the makers of gas and oil engines in this country, and has led them to avoid the large cylinder, so common in Germany before the war, in favour of a multiplicity of smaller cylinders.

Science in the War

Though British men of science had not formerly been adequately recognised in relation to war and the safety of their country, yet at the call of the sailors and the soldiers

they whole-heartedly, and with intense zeal, devoted themselves to repair the negligence of the past, and to apply their unrivalled powers and skill to encounter and overcome the long-standing machinations of the enemy. They worked in close collaboration with the men of science of the Allied nations, and eventually produced better war material, chemicals, and apparatus of all kinds for vanquishing the enemy and the saving of our own men than had been devised by the enemy during many years of preparation planned on the basis of a total disregard of treaties and the conventions of war.

Four years is too short a time for much scientific invention to blossom to useful maturity, even under the forced exigencies of war and Government control. The work of the scientists during the war has perforce been directed more to the application of known principles, trade knowledge, and properties of matter to the waging of war, than to the making of new and laborious discoveries; though, in effecting such applications, inventions of a high order have been achieved, some of which promise to be of great usefulness in time of peace.

Expenditure of Ammunition

The destructive energy in the field and afloat has multiplied many hundredfold since the time of the Napoleonic wars; both before and during the war the size of guns and the efficiency of explosives and shell increased immensely, and many new implements of destruction were added. Modern science and engineering enabled armies unprecedented in size, efficiency, and equipment to be drawn from all parts of the world and to be concentrated rapidly in the fighting line.

A few figures will assist us to realise the great difference between this war and all preceding wars. At Waterloo, in 1815, 9,044 artillery rounds were fired, having a total weight of 37.3 tons, while on one day during the last offensive in France, on the British front alone, 943,837 artillery rounds were fired, weighing 18,080 tons—over 100 times the number of rounds, and nearly 540 times the weight of projectiles. Again, in the whole of the South African War 273,000 artillery rounds were fired, weighing approximately 2,800 tons; while during the whole war in France, on the British front alone, over 170 million artillery rounds were fired, weighing nearly 3½ million tons—622 times the number of rounds, and about 1,250 times the weight of projectiles.

However great these figures in connection with modern land artillery may be, they become almost insignificant when compared with those in respect of a modern naval battle squadron. The Queen Elizabeth when firing all her guns discharges eighteen tons of metal and develops 1,870,000 foot-tons of energy. She is capable of repeating this discharge once every minute, and when doing so develops by her guns an average of 127,000 effective horse-power, or more than one and a-half times the power of her propelling machinery; and this energy is five times greater than the maximum average energy developed on the Western front by British guns. Furthermore, if all her guns were fired simultaneously, they would for the instant be developing energy at the rate of 13,132,000 horse-power. From these figures we can form some conception of the vast destructive energy developed in a modern naval battle.

The successful development of sound-ranging apparatus on land led to the suggestion by Professor Bragg that a modified form could be used to locate under-water explosions. It has been found that the shock of an explosion can be detected hundreds of miles from its source by means of a submerged hydrophone, and that the time of the arrival of the sound wave can be recorded with great precision. At the end of the war the sound-ranging stations were being used for the detection of positions at sea required for strategical purposes. The same stations are now being used extensively for the determination of such positions at sea as light-vessels, buoys, which indicate channels and obstructions, such as sunken ships. By this means ships steaming in fog can be given their positions with accuracy for ranges up to 500 miles.

Sources of Power

Viewing the present trend of developments in harnessing water-power and using up the fuel resources of the world for the use and convenience of man, one cannot but realise that, failing new and unexpected discoveries in science, such as the harnessing of the latent molecular and atomic energy in matter, as foreshadowed by Clerk Maxwell, Kelvin, Rutherford, and others, the great position of England cannot be maintained for an indefinite period. At some time more or less remote—long before the exhaustion of our coal—the population will gradually migrate to those countries where the natural sources of energy are the most abundant.

The amount of available water-power in the British Isles is very small as compared with the total in other countries. According to the latest estimates, the total in the British Isles is under 1½ million horse-power, whereas Canada alone possesses over 20 millions, of which over two millions have already been harnessed. In the rest of the British Empire there are upwards of 30 millions, and in the remainder of the world at least 150 millions, so that England herself possesses less than one per cent. of the water-power of the world. Further, it has been estimated that she only possesses 2½ per cent. of the whole coal of the world.

Coal Supplies

I have said that England owes her modern greatness to the early development of her coal. Upon it she must continue to depend almost exclusively for her heat and source of power, including that required for propelling her vast mercantile marine. Nevertheless, she is using up her resources in coal much more rapidly than most other countries are consuming theirs, and long before any near approach to exhaustion is reached her richer seams will have become impoverished, and the cost of mining so much increased that, given cheap transport, it might pay her better to import coal from richer fields of almost limitless extent belonging to foreign countries, and workable at a much lower cost than her own.

Let us endeavour to arrive at some approximate estimate of the economic value of the principal sources of power. The present average value of the royalties on coal in England is about 6d. per ton, but to this must be added the profit derived from mining operations, after paying royalties and providing for interest on the capital expended, and for its redemption as wasting capital. After consultation with several leading experts in these matters, I have come to the conclusion that about 1s. per ton represents the pre-war market value of coal in the seams in England.

It must, however, be remembered that, in addition, coal has a considerable value as a national asset, for on it depends the prosperity of the great industrial interests of the country, which contribute a large portion of the wealth and revenue. From this point of view the present value of unmined coal seems not to have been sufficiently appreciated in the past, and that in the future it should be better appraised at its true value to the nation.

This question may be viewed from another aspect by making a comparison of the cost of producing a given amount of electrical power from coal and from water-power. Assuming that one horse-power of electrical energy maintained for one year had a pre-war value of £5, and that it requires about eight tons of average coal to produce it, we arrive at the price of 6s. 3d. per ton—*i.e.*, crediting the coal with half the cost. The capital required to mine eight tons of coal a year in England is difficult to estimate, but it may be taken approximately to be £5, and the capital for plant and machinery to convert it into electricity at £10, making

a total of £15. In the case of water-power, the average capital cost on the above basis is £40, including water rights (though in exceptionally favoured districts much lower costs are recorded).

Water-Power

From these figures it appears that the average capital required to produce electrical power from coal is less than half the amount that is required in the case of water-power. The running costs, however, in connection with water-power are much less than those in respect of coal. Another interesting consideration is that the cost of harnessing all the water-power of the world would be about 8,000 millions, or equal to the cost of the war to England.

Dowling has estimated the total coal of the world as over seven million million tons, and whether we appraise it at 1s. or more per ton, its present and prospective value is prodigious. For instance, at 6s. 3d. per ton it amounts to nearly one hundred times the cost of the war to all the belligerents.

In some foreign countries the capital costs of mining are far below the figures I have taken, and, as coal is transportable long distances, and, generally speaking, electricity is not so at present, therefore, it seems probable, that capital will in the immediate future flow in increasing quantity to mining operations in foreign countries rather than to the development of, at any rate, the more difficult and costly water-power schemes. When, however, capital becomes more plentiful the lower running costs of water-power will prevail, with the result that water-power will then be rapidly developed.

The Earth's Interior

As to the possible new sources of power, I have already mentioned molecular energy, but there is another alternative which appears to merit attention. In my address to Section B in 1904, I discussed the question of sinking a shaft to a depth of 12 miles, which is about ten times the depth of any shaft in existence. The estimated cost was £5,000,000, and the time required about 85 years. The method of cooling the air-locks to limit the barometric pressure on the miners and other precautions were described, and the project appeared feasible. One essential factor has, however, been queried by some persons: Would the rock at the great depth crush in and destroy the shaft? Professor Frank D. Adams, of McGill University, Montreal, has carried out exhaustive experiments, published in the *Journal of Geology* for February, 1912, showing that in limestone a depth of 15 miles is probably practicable, and that in granite a depth of 30 miles might be reached.

Little is at present known of the earth's interior, except by inference from a study of its surface, upturned strata, shallow shafts, the velocity of transmission of seismic disturbances, its rigidity and specific gravity, and it seems reasonable to suggest that some attempt should be made to sink a shaft as deep as may be found practicable and at some locality selected by geologists as the most likely to afford useful information.

When we consider that the estimated cost of sinking a shaft to a depth of twelve miles, at present-day prices, is not much more than the cost of one day of the war to Great Britain alone, the expense seems trivial as compared with the possible knowledge that might be gained by an investigation into the unexplored region of the earth. It might, indeed, prove of inestimable value to science, and also throw additional light on the internal constitution of the earth in relation to minerals of high specific gravity.

In Italy, at Lardarello, bore-holes have been sunk which discharge large volumes of high-pressure steam, which is being utilised to generate about 10,000 horse-power by turbines. At Solfatara, near Naples, a similar project is on foot to supply power to the great works in the district. It seems, indeed, probable that in volcanic regions a very large amount of power may be, in the future, obtained directly or indirectly by boring into the earth, and that the whole subject merits the most careful consideration.

Resources of the Empire

The whole question of the future resources of the Empire demands the serious attention of all scientists. In such a task, some people might suggest, we need encouragement and assistance from the Government of the country. Surely we have it. A great experimental step towards the practical realisation of Solomon's House, as prefigured by Lord Bacon in the "New Atlantis," is being made by the Government at the present time. The inception, constitution, and methods of procedure of the Department, which was constituted in 1915, were fully described by Sir Frank Heath in his paper to the Royal Society of Arts last February. An important part of the work of the Department has been to foster and to aid financially associations of the trades for the purposes of research. There are also signs of great increase of research by individual factories. Whether this is due to the indirect influence of the Research Department or to a change in public opinion and a more general recognition of the importance of scientific research it is difficult to say.

The possibility of the uncontrolled use on the part of a nation of the power which science has placed within its reach is so great a menace to civilisation that the ardent wish of all reasonable people is to possess some radical means of prevention through the establishment of some form of wide and powerful control. Has not science forged the remedy, by making the world a small arena for the activities of civilisation, by reducing distance in terms of time? Alliances and unions, which have successfully controlled and stimulated republics of heterogeneous races during the last century, will therefore have become possible on a wider and grander scale, thus uniting all civilised nations in a great League to maintain order, security, and freedom for every individual, and for every State and nation liberty to devote their energies to the controlling of the great forces of Nature for the use and convenience of man, instead of applying them to the killing of each other.

Chemistry and the War

Address by Sir William Pope

In a paper on this subject Sir William Pope said it could not be doubted that one of the most important contributories to the recent war was the striking contrast between the material resources of Germany and of the rest of Europe. In no domain was this contrast more evident than in that of the chemical industries; no branch of scientific technology was more immediately concerned with the arts of war than that which includes all the great industries in which chemistry takes a leading part. Germany, in 1914, was in possession of well-established organisations for the manufacture of coal-tar colours; she provided the great bulk of the artificial dyestuffs consumed throughout the world. Small installations existed in this country, France, and America, but the scale upon which operations were conducted outside Central Europe was insignificant. The outbreak of war was the signal for the conversion of all these great colour-making factories into manufactories for high explosive. The British demand for high explosive, the materials which formed the bursting charge for shell, rose to about 1,000 tons each of T.N.T. and picric acid and about 3,000 tons of ammonium nitrate per week; the complex facilities for the manufacture of these enormous quantities of material were practically non-existent at the beginning of the war in this country, but Germany was in a position to meet all her military demands by a mere rearrangement of her coal-tar colour works. So lacking were our means for utilising the great source of wealth represented by coal-tar that during the first year of war 80 per cent. of our output of T.N.T. was derived from toluens contained in Borneo petroleum. The British demand for cordite rose to about 2,000 tons per week; the beginning of the war found us with neither works nor chemists for the manufacture of these quantities. One of the chief essentials to a modern army or navy was quinine; 97 per cent. of the world's quinine production came from the Dutch colony of Java, and its import into Europe was practically under German control. A large number of other essential pharmaceutical products, such as salicylic acid, salvarsan, and local anæsthetics, such as eucaine and novocaine, were made almost entirely in Germany. Most of the fine photographic chemicals used in development and in the preparation of pan-

chromatic plates were made almost exclusively in Germany; the initial lack of these constituted a heavy handicap to our air photographic service. Many of the essentials to the manufacture of special steels necessary to modern warfare, such as tungsten and the like, came to us from Germany.

Germany's Initial Advantage

The control which Germany had secured over the manufacture of such products as coal-tar colours, pharmaceutical chemicals, and the like, enabled her to throw her enemies into confusion by a purely economic method at the outbreak of war; this initial advantage was gained whilst entirely satisfactory arrangements were provided, by the stoppage of exports, for the manufacture of the necessary quantities of explosives, &c., at home. Another advantage was, however, derived from the advanced development of the German chemical industries.

The fundamental essential in the manufacture of explosives was nitric acid or its salts. The world's supply of nitric acid salts had been hitherto obtained from the Chili saltpetre of South America; it was obvious that Germany could not go to war whilst dependent upon an oversea supply of this absolute necessity. It was known, however, that previous to the war Germany was busily engaged upon the perfection of methods for manufacturing nitric acid and its salts from atmospheric nitrogen; this work came to a successful head in Germany not long before the outbreak of war, and she then became independent of oversea supplies of nitric acid. Was it to be doubted that this development of chemical industrial effort was not a factor in the declaration of war?

Whilst, during five years of war, this country succeeded in expanding its previously small installations for fine chemical manufacture to such an extent that they became of sufficient magnitude to meet the immense demands for military explosives, one essential difference was observable between the German practice and that initiated to fulfil corresponding war needs in this country. The German establishments were developed on a peace footing, and produced materials consumed by the whole world; they paid heavy dividends, and were a source of great national wealth in time of peace. At the same time they were available for mobilisation for war production of explosives at short notice. The whole world, in fact, paid for the erection and extension of the vast explosives factories which made Germany so formidable in 1914; the British Empire paid for the German munition factories, just as it paid for Gretna. Now that war was over, the German factories remain intact, and can revert immediately to their former task of providing our Empire with dyes, pharmaceutical and photographic chemicals, &c., as a dividend-paying proposition. The great German synthetic nitrogen products works, developed so as to render Germany independent of seaborne nitrates for explosives manufacture, now produced a considerable proportion of the nitrates and ammonium salts needed by Europe as agricultural manure. During the war the German synthetic nitrogen products factories had been greatly extended, and these extensions constitute a valuable asset to the German commerce of the near future. In this country it has not been possible to build up a chemical manufacture for war purposes which could be at once diverted to production for peace requirements. Explosives factories had had to be put up hurriedly for war production alone; the organisation could not be developed at short notice in such a way that the factories acquired any considerable after-war value. Thus the vast installation at Gretna was now practically on the scrapheap. Whilst the German chemical industries emerged from the war in a stronger position than they held before, our own remain much where they were.

Germany and the Manufacture of fine Chemicals

One point, however, might be insisted upon: Germany had never commanded any monopoly of scientific talent which has enabled her to secure supremacy in fine chemical manufacture; in fact, a disproportionately large number of German technical products were discovered by scientific workers in Great Britain. A remarkable illustration of this fact occurs in connection with the materials which had been used in chemical warfare. Thus phosgene was discovered by John Davy in 1812, but only insignificant quantities had been made in this country; it was manufactured in considerable quantities in Germany for use in coal-tar colour preparation. The best and most economical methods of manufacture had been worked out on a peace basis in Germany; phosgene was an extremely poisonous substance, and was early used by the Germans in gas warfare. Large quantities of phosgene were used by us for the same purpose, but only after the delay caused by the necessity of time for working out the most convenient methods of manufacture and the construction of plant. Again, chloropicrin was discovered by James Stenhouse in 1848, and was highly poisonous; the Germans used it as a toxic material in gas warfare, being able to prepare it in quantity in the dye factories, and we, after the necessary delay for working out methods and installing plant, also used it in large quantities. The most powerful agent of all used in gas warfare—mustard gas—was discovered by Frederick Guthrie in 1860; the Germans were able to make it in their colour factories by an extremely complicated method, and used it against us in June, 1917. It took us about a year to work out and instal a method of manufacture—much superior, it was true, to the German procedure—with which to arm the necessary retaliatory measures. All the above substances were British discoveries, but at the outbreak of war we had no facilities for their large-scale manufacture, whilst the flourishing coal-tar colour industry of Germany was able to provide them in quantity. Now that serious endeavours were being made to place fine chemical manufacture on a proper basis in Great Britain it should be the duty of all interested to insist that the great schools of experimental science in the country should be financed on such a scale as to enable them to train efficiently the vast amount of young inventive talent which the war has shown to exist among us; only by so doing will it be possible to secure the large numbers of highly trained young scientific men who would be needed, not merely for the purpose of gaining the knowledge required for the manufacture of articles of commerce already supplied by Germany, but for producing new inventions which would carry us in front of German effort.

Our Record in Chemical Discovery

The record of Great Britain in chemical discovery was one of which she might well be proud, and many chemical industries now well established in Germany may be justly claimed as based entirely upon British discoveries. The coal-tar colour industry was initiated by the discoveries of Perkin, and was indeed established by him in this country before it was ultimately transferred almost wholly to Central Europe. Again, about a century and a half ago, Henry Cavendish discovered that atmospheric nitrogen and oxygen could be caused to combine at the high temperature of the electric spark; this process, carried out on a minute scale in the laboratory by Cavendish, had been put into large-scale operation in Central Europe, and was used for the manufacture of huge quantities of nitric acid in Germany. Here, again, the development of a great scientific discovery made in this country had been left to Germany, and none of the practical fruits of the discovery have been gathered in Great Britain. The history of the war consisted of a series of sequences in which some sudden military emergency had been met by rapid British scientific invention, put into rapid practice by British technical effort. It could never be said again that this country was deficient in scientific skill or in technical ability.

It is, of course, obvious that the lessons which have been so forcibly brought home to us during the war must be applied by us in peace if the history of the past five years was not to be repeated. The building up of all branches of chemical industry was necessary, and, to the promotion of that end, a great extension of the facilities for scientific education available in this country. In one respect, at least, the British Empire was in a highly favoured position; in one part or other it produced every raw material needed in its manufacture, although it had in the past left these sources of supply to be exploited by the foreigner. One great danger threatened us now. The large German colour works were again resuming their pacific manufacture of dyes and pharmaceutical products, and one of the foremost German dye manufacturers, Professor Carl Disberg, of Leverkusen, who helped his country valiantly in providing the materials for gas warfare, had just expressed the hope that he would be over in America again "very soon to see his old-time friends" (*Journ. Indus. Engin. Chem.*, 1919, 11, 509). We were on the eve of a great German propaganda movement for the purpose of rehabilitating the German chemist in the eyes of the world.

Discussion

The PRESIDENT said that the science of chemistry has suffered more materially in the past than any other by reason of lack of public and official recognition, but possibly after what had happened during the war, things would improve in the future. At times he thought they would, but at others he thought they would not. During the war it was impossible to fill the positions for which chemists were required, but now there were chemists wanting positions.

PROFESSOR H. E. ARMSTRONG said he thought the paper ought really to have been read before the Economic Section. At times we

were too prone to exaggerate the importance of chemistry in this connection relatively. Take the case of synthetic indigo. To him the marvel was not that the Germans were successful as chemists in doing what they did, but that they were successful in exercising forethought thirty years in advance and in seeing that there was a problem worth dealing with and spending any amount of money on from the chemical side. What we should ask ourselves was, Why were the Germans such a long-headed nation and we such a short-headed one? At any time during the past thirty years we might have done what we had done during the war if there had been a sale for the products of the universities in the shape of chemists. Instead of that, too many students went to the Bar simply because there was not a proper encouragement of them. He did not know whether there had been any advance in the attitude of manufacturers as a result of the war. He was inclined to think there had not been. The engineer and the chemist were not working harmoniously here even now. They were in Germany. The engineer still thought too little of the chemist; he thought that he was the real man and never gave the chemist a chance. That state of affairs must be altered, and more particularly was it necessary to alter the outlook of the commercial man, or at least the education of the classes who were to be manufacturers and men of commerce. The question was, whether they were likely to do that. There was some peculiar quality in the German which made him more receptive than ourselves. He had never been in the house of an English manufacturer and met with the same culture that he had met with from similar men in Germany. People in this country would not take risks and look ahead and be prepared not to have big returns at once. The Germans had worked out everything during the war so that it would be of benefit to their manufacturers after the war, where as we in this country were really worse off now than we were before the war.

Sir Robert Robertson said that besides the training of chemists academically, there was an urgent need for technical training, and it was to be hoped that facilities would be given for that training. In his opinion, the training for an industrial chemist should be non-specialisation in the first instance and a thorough grounding on the academic side followed by a period in a factory, and then a return to some institution where he would receive guidance in technical training. In that institution he would be best left alone with simple appliances and given the solution of a definite problem. In that way he would work out his own salvation, and if there was anything in him he would become a chemical technologist. That there would be a demand for this type of man in the future was undoubted, but at present the outlook in regard to remuneration was deplorable.

Sir William Pope, in a brief reply, said he ought to mention that Sir Robert Robertson was primarily responsible for working out the large scale manufacture of T.N.T., and that was a thing which every member of the nation could not be too grateful for.

General Hartley on Chemical Warfare

In a paper before Section B (Chemistry) on Tuesday, September 9, Brigadier-General H. Hartley gave an exhaustive and interesting account of gas warfare, and described the work of British chemists in this connection. Having explained that gas attacks were made in two ways—(*a*) in clouds and (*b*) by projectiles—he mentioned that the first German gas attacks were made in 1915, when our troops were wholly or partially unprotected. In the first attack a great opportunity was missed by the Germans owing to the use of gas in low concentration and too small quantities, and even then the Germans failed to exploit the partial success gained in these attacks. We then formed a special brigade, consisting of specially enlisted chemists, and from the formation of that brigade we liberated in France about 5,700 tons of gas, 25 per cent. being in the form of cylinder or cloud attacks, and the remainder in the form of projectiles. Development, both on the part of the Allies and the Germans, was then rapid. The German effort was directed to using little known organic compounds, hundreds of tons of complex organic derivatives, previously only prepared once or twice in a laboratory, being utilised. In 1916, chlormethylchloroformate (B.P. 105° C.), with toxic properties similar to phosgene, was introduced and used against us. Later this was replaced by the trichloro compound (B.P. 128° C.), which was used until the end of the war as the well-known Green Cross shellfilling. Phosgene was also introduced in trench-mortar bombs. During the Arras battle of 1917, a variant appeared with asphyxiant properties, whilst in July, 1917, mustard gas made its appearance. Other varieties were introduced at various times. In the preparation for his attack in March, 1918, 90 per cent. of the enemy ammunition contained gas; it was never before used on such a scale, and from then until the end of the war, both defensive and offensive operations were carried on by the aid of gas shells to a very considerable extent. A large number of extracts from a confidential report of General von Bulow, commanding the 1st German Army during the battle of Arras, dated April 11, 1917, were read by Brigadier-General Hartley, which showed conclusively that our retaliatory measures in the use of gas had successful results. Other extracts from further German documents were also read to the same effect. Then followed a discussion of the value of gas as a weapon in warfare, and a comparison of it with other weapons.

The work of British Chemists

Coming to the work of British chemists, Brigadier-General Hartley said that researches were carried out in many laboratories, and a debt of gratitude was owing to professors and their assistants for the manner in which they worked on substances that were never pleasant, and often involved considerable risks. In April, 1915, we had only one plant producing liquid chlorine, with an output of 7 tons per week, but the energy of manufacturers enabled the first gas attacks to be made in September, 1915, and by December 31,800 tons of gas had gone to France. Production increased steadily from that date, the output being:—1915, 860 tons; 1916, 5,750 tons; 1917, 18,500 tons; 1918 (ten months), 15,500 tons. This, considering our unpreparedness, was a very satisfactory result. But comparison with the German output, thanks to their great resources, showed the importance of developing our organic chemical industry, otherwise we might find ourselves at the mercy of any Power which had developed its resources in this respect and was prepared to take full advantage of them on the outbreak of a war. If any country dominated this industry as Germany did before the war, it was liable to become a standing menace to the peace of the world. More important even than offence was the means of defence against gas attacks, and it was difficult to over-estimate the value of the work of the anti-gas department, under the leadership first of Sir William Horrocks, and later of Lieut.-Colonel Harrison. The latter gathered under him an enthusiastic group of young chemists and physicists, and the box respirator represented the joint results of their researches, carried out under his inspiration and controlled by his admirable practical judgment. He organised its manufacture on a huge scale, and it was a great testimony to his foresight and ability that, in spite of difficulties of production, supplies promised to France never failed. Altogether 55,000,000 respirators were produced by the department, and of these 19,000,000 were box respirators. Examples of the various types of gas mask, showing the stages in development, were exhibited.

Chemists in the War Zone

Continuing, the author said that many chemists were employed in England and the theatres of war in advising on technical matters connected with gas warfare, in organising gas defence, and in training and instructing the troops. That work had not been generally known or properly appreciated. The training of the men in the use of the respirators was as important as the design of it, because it gave them confidence in its use. The gas officer or chemical adviser in France had a very responsible post. In addition to his instructional and advisory duties he acted as intelligence officer so far as gas was concerned, investigating every attack to discover means of improving our defence, and collecting evidence of the result of our own gas operations. All new appliances were sent to him for a service test and criticism. Their work was of great value, as being in constant touch with first-line conditions, they were in a position to criticise new appliances and to foresee future needs. Without their criticism and advice progress would have been far slower and less certain. A field laboratory was formed in April, 1915, for investigating enemy material and solving urgent problems. The success of the laboratory owed much to the mechanical ingenuity and critical ability of Lieut.-Colonel W. Watson, the first director of the laboratory, and to the resourcefulness of his successor, Lieut.-Colonel B. Mount-Jones, who was mainly responsible for the chemical work from its formation. The instruction given at the gas schools was able to counteract to a great extent the disadvantage under which we suffered owing to the lack of scientific training among all ranks.

In conclusion, the author said that had the enemy foreseen the results of his treachery in introducing this new weapon in April, 1915, it would never have been employed. As it was, it provided another example of the German lack of foresight and their underestimate of their opponents, which might have delayed a decision, but only to make it the more complete and crushing in the end.

Discussion

The President remarked that one of the sad things of the war was the manner in which scientific knowledge had been prostituted, more especially in connection with gas warfare. It was clear that this weapon would now be permanently established as a weapon, and

chemists would have to take a more active part not only in offensive but also in defensive matters.

PROFESSOR H. E. ARMSTRONG, F.R.S., said this was the first public opportunity that had been afforded of thanking Brigadier-General Hartley and his class for the wonderful work they had done on behalf of the nation, and it all went to show what we were capable of when we were forced to do it. He ventured to deprecate, however, the conclusion drawn by the author that the Germans displayed lack of foresight in introducing gas warfare. Nobody could have foreseen what the effect of such new methods of attack would be. He did not believe, as the President had stated in his address, that the system of education alone was at the bottom of the difference between us and the Germans, although it had a great deal to do with it, and if we were aiming to put ourselves on a level with the Germans we must adopt their system of higher education in principle. At the same time, it was the "nature of the beast," which made the German so different from us.

Arsenical Compounds

PROFESSOR MORGAN said that one point had scarcely been touched upon, and that was, what about the future? Chemical warfare had come to stay, and within the next fifty years, or even twenty or ten years, our soldiers would have to go out and face a new chemical warfare, and that being so, it was essential for the military staffs of all nations which looked forward to being aggressors or defenders in the future to investigate the new compounds which could be discovered far more noxious than those already employed, bad enough as they were. He was especially interested in arsenical compounds, and it would be easily possible to find new compounds in this connection more irritating than any used hitherto, and he believed that was true of other compounds as well. At the moment we were losing our war psychology and were going in for peace and retrenchment all round. Chemical warfare research, however, was not a very expensive matter relatively, and, say, £200,000 a year would enable us to hold a watching brief on what was being done elsewhere. Hitherto most of this research had been done voluntarily, but he thought the time had come when chemists should be well paid for this work.

PROFESSOR ARMSTRONG thought the paper of such value that the Section ought to arrange for its publication in full.

The PRESIDENT said the suggestion would be placed before the Committee of the Section.

The AUTHOR, replying to the discussion, agreed with what Professor Morgan had said about the study of gas warfare being continued during peace time. The whole question of military research was an extremely important one, and if the Section could take some steps to see that a portion of the money now being allocated to research was set aside for the particular purpose referred to it would be a good thing. By spending large sums on the fighting services without providing for research meant wasting the whole of the money so used.

High Explosives

In the afternoon of Tuesday, September 9, Lieut.-Colonel C. D. Crozier delivered a long and illustrated lecture on the subject of high explosives. The author was Director of Inspection of High Explosives during the war, so that although he was not a professional chemist he felt that he was in a unique position to put before the Association what an immense debt this country owes to it chemists and chemical engineers, and, in fact, to the whole chemical industry.

Before the war practically every nation used picric acid, either direct or with admixture with paraffin wax, and perhaps some other slight additions. At the beginning of the war, however, our only sources of supply were a few small firms in Yorkshire. As demonstrating how the problem was tackled he exhibited a curve showing that whereas the total home production in the six months of 1914 was 331 tons, in some weeks in 1917 it reached 1,000 tons per week. In 1918 production was slackened off as T.N.T. and ammonium nitrate forged ahead, but in 1917 the total output was 32,053 tons, which fell to 15,160 tons on December 31, 1918. The production of ammonium nitrate in 1918 was 182,551 tons, and of T.N.T. 84,979 tons, the latter falling from 94,796 in the previous year. The curve also showed that with all three we did not seriously start manufacture until 1916, the previous year and part of 1914 being taken up in getting to a really large production. Picric acid in 1914 was entirely made by the pot process, a very uneconomical method. Theoretically, 100 lb. of carbolic should make 242 lb. of picric, but 180 lb. was about the average result, and 185 lb. was a very good one. Altogether the pot process was not one adapted to large output. Numerous cases had occurred of drying stoves going on fire, and then the picric would burn off violently, or actually explode or detonate. It was a peculiar thing that since the war cases of stoves exploding, instead of burning off, had been more numerous than in peace times. This had been a matter of great concern to the Ministry of Munitions and the Home Office, but so far no satisfactory explanation had been forthcoming. Very great improvements, however, had been made in isolating the "dry end" of picric works from the "wet end," where the nitration and washing were carried out.

Picric Acid

In order to improve the supplies of picric acid the denitrophenol method was adopted. Denitrochlorbenzol was a product largely manufactured in peace times by the United Alkali Co. for the manufacture of aniline dyes, and the conversion of this into denitrophenol was worked out and put into operation by this company. The problem then was to further nitrate this denitrophenol into trinitrophenol, or picric acid—that is, to add the third nitro group. This problem, which opened up a totally new field of supply, was entrusted to Major L. B. Holliday, of the newly formed firm of L. B. Holliday & Co., Ltd., of Huddersfield, and in all 7,988 tons of the very best picric acid was delivered by this company by this process.

Meantime, very great improvements had been made over the old pot method of making picric acid, and the new factory of Holliday's was illustrated as typical of the great change that has come over the method of manufacture.

The considerable stocks of synthetic phenol which were accumulating made it desirable to consider an improved method for the direct nitration of picric. In view of the experience gained by Major Holliday in the D.N.P. nitration process, and from experiments carried out in his factory, the Ministry of Munitions decided to erect a new factory at Bradley, built to the designs of Major Holliday, for the direct nitration of phenol in large quantities in large enamelled vessels instead of by the old pot method. Major Holliday, in bringing both these processes to a successful issue, had proved himself a pioneer in the manufacture of picric acid.

A Novel Process

There was another and quite novel process of making picric acid which the war had produced, known as Brooke's continuous process. Early in the war, Mr. Newton Brooke, who previously had not had anything to do with the chemical industry, started making picric acid on the old pot method, but dissatisfied with the labour involved in this, started to devise something else. The continuous plant which had been devised consisted of an acid-proof brick tank, about 160 ft. long, and a tank of this length would produce 20 to 30 tons per week continuously. The phenol sulphonic acid, diluted with water, was first made, and entered the plant at one end; the nitric acid, 0.65 per cent. strength, is admitted by a series of aluminium jets. It comes in contact with the phenol sulphonic acid, and the reaction at once commences. A little waste nitration acid is allowed to flow along with the phenol and nitric acid, and it acts as a carrier for the picric acid, both by solution and mechanically by increasing the flow through the trough. When nitration is complete the picric acid moves forward through cooling sections of the trough, and is finally delivered at vacuum filters, where it is separated from the waste nitration acid. The picric is then washed in the ordinary way. An essential feature of the process is the low temperature of nitration, which on the average does not exceed 102° C., thus saving oxidation of the phenol, as in the pot method, where temperatures of 115° C., and even 120° C., are frequently experienced. With a prolonged run the yield of picric acid on the original weight of phenol was found to be 194 per cent., against 180 per cent. with the pots. Altogether it was a very convenient process to work, and Mr. Brooke and his chemists were to be congratulated on their enterprise. They came new to the trade, and had certainly achieved quite a new departure.

Turning to T.N.T., here again, said the lecturer, the methods of manufacture had been considerably improved. The biggest factory for the production of this was at Queensferry, Chester, which delivered some 55,000 tons. This factory, and also that at Gretna, which was devoted to the production of propellants, were outstanding monuments to the genius of Mr. K. B. Quinan, and, although he had read some criticism of these factories, he had yet to read how the war could have been won without them. The other great factory and rival of Queensferry in the production of T.N.T. was H.M. factory at Oldbury, managed by Messrs. Chance & Hunt. In addition to a great deal of useful experimental work, an entirely novel method of manufacture of T.N.T. by a continuous process was evolved, and eventually the whole of the T.N.T. was turned out by this process. He was not, however, at liberty to give details, but it was a method he should like to employ if he were a T.N.T. manufacturer.

Ammonium Nitrate

Owing to the great demand for high explosives it was found necessary to devise means for making the T.N.T. go further, and this was effected through the agency of ammonium nitrate, and the mixture of these two was known as amatol. In all, 378,395 tons of ammonium nitrate were provided, and the simple method of mixing nitric acid and ammonia to make ammonium nitrate was quite impossible to supply the huge war consumption, as less nitric acid than ever was available. Here the well-known and progressive firm of Brunner, Mond & Co. came to the rescue, and they undertook the manufacture of ammonium nitrate, in addition to their many other products. Altogether nine large separate and distinct installations in England were employed by them, either directly or under their control. At first it was made from Norwegian nitrate of lime, but the supplies of this were inadequate, and Brunner, Mond & Co. adapted plant at their Lostock works to make ammonium nitrate directly from sodium nitrate by reaction with ammonium bicarbonate, a process of great complexity and difficulty, the chemical equilibria involved being most delicate. Still the cry came for more ammonium nitrate, and it was decided to make calcium nitrate at home. The raw material was at hand in the form of calcium chloride, which was a waste product of the ammonia soda process for which Brunner, Mond & Co. were famous. The very large Victoria Works at Wincham, Cheshire, were designed and built with the greatest possible speed to supply the ever-growing demands for this calcium nitrate, and Lostock, where the conversion took place, had to be enlarged to deal with these large supplies. All this time, in spite of what had already been done, a long and difficult laboratory investigation was being carried out by Brunner, Mond's research staff, and they capped their previous efforts by working out an entirely new process for the direct preparation of ammonium nitrate from ammonium sulphate and sodium nitrate. This new sulphate-nitrate process was put into operation first at the firm's Sandbach works. It proved very successful, and a large plant was erected at Swindon from the experience gained at Sandbach. The United States Government Commission, after a careful study of the various processes, decided to adopt the new sulphate-nitrate process, and the huge works at Perrivale, Maryland, with a producing capacity of some 3,000 tons per week, was working the process with great satisfaction. For these works Brunner, Mond & Co. supplied the plans and details.

Ammonium Perchlorate

Finally, the paper dealt with ammonium perchlorate explosives, which, being more sensitive than ammonia nitrate, were not used in gun shell. They were, however, used extensively in submarine mines, and the principal minefields across the North Sea were filled with ammonium perchlorate explosives, of which the perchlorate was manufactured by the United Alkali Co. at their works at Flint. The great advantage of ammonium perchlorate was that it could be made in this country from our own raw materials. The details of the process, however, were secret. The erection of the plant was begun at the end of 1915, and manufacture on a commercial scale was commenced on October 1, 1916. The output was 60 tons per week. Dr. Farmer, the Chief Chemist of the Explosives Department, had succeeded just prior to the cessation of the war in evolving a perchlorate mixture which would stand up to the rifle bullet as successfully as amatol.

In concluding his paper the author gave an account of the formation of the Explosives Department, and paid a tribute to the work of the universities contiguous to manufacturers, viz., Birmingham, Leeds, Liverpool, Manchester, and later Edinburgh, and their chief officials, for assistance in regard to testing the vast quantities of explosives that went through their hands. Due to this assistance, the cost of inspection of £100 sterling worth of material was only a few pence. He also expressed the thanks of the Department to the manufacturers for their assistance, and incidentally expressed the hope that the Press, which was always accusing Government Departments of waste, would sometimes look on the other side, and give credit for good work done.

Prof. H. B. Dixon proposed a vote of thanks to the lecturer.

Sir Robert Robertson, in seconding, said that after the achievements of the highest technical order which had been attained at Queensferry, the plant and buildings there should be taken advantage of. He had suggested that it should be turned into a university, with Mr. K. B. Quinan as principal. That was off, but some use should be made of the Queensferry works because of the multitude of technical matters which were dealt with there and the manner in which technical difficulties had been overcome.

Professor Bedson's Address

Professor Bedson, after referring to the deaths of Sir William Ramsay in 1916, and of Sir William Crookes, Baeyer, and Fischer during the interregnum since the last meeting of the Section, recalled that it is fifty years ago since Mendelief communicated to the Russian Chemical Society a memoir which has exercised a profound influence on chemical philosophy, and continues to serve as a guide in the interpretation of research and speculations on the nature of elements. Consequently, we might look upon this year as the jubilee of the Periodic Law. After reviewing some of the features of the rise and development of the Periodic Law, which had now been established as an article of belief in chemical philosophy and was the mainspring and inspiration of the greater part of modern organic research, he continued:—

I purpose now to direct attention to matters of another nature, which appear to me of interest to chemists, and to that extent have a bearing on the welfare of chemistry in this country. Among the numerous revelations and surprises of the past five years has been the realisation on the part of the public and the Government of the importance of the chemical industries to the national well-being. The apathy and indifference of pre-war times were replaced by an apparently lively interest in things chemical, and there was what in the religious world would be styled a revival.

Industrial Insufficiency

Politicians, the Press in all its varied forms—daily, weekly, monthly, and quarterly—took up the subject of our industrial insufficiencies, and emphasised in various ways the importance of research in connection with our industries. Again, the coal-tar colour industry furnished, as it had done again and again, some thirty to forty years ago, the text from which research and its importance was preached. This time the reiteration had the effect that the "aniline phantasm," as I have seen it described, was recognised as a "key industry," important to the vitality of the manufacture of textiles; with the result that the Government, discarding its fiscal policy, was induced to subsidise the enterprise for the manufacture of dyes and other coal-tar products. The negotiations preceding the formation of the "British Dyes Co., Ltd.," have been remarkable as revealing that in the eyes of some, at any rate, special knowledge is a "dangerous thing," and, in fact, was deemed sufficient to exclude its possessors from a seat on the directorate. This is all the more remarkable, as the history of similar enterprises in Germany shows the *personnel* of the directorates to be made up of university-trained men and, in not a few instances, of professors. So that in Germany, academic distinction and theoretic learning are not considered as excluding the possession of commercial acumen and those other qualities needed in a successful man of business. In the early stages of the war the demand for explosives was met by the expansion of already existing factories, the increase in staff of which called for many additional men with chemical training, a call which became unprecedented and insistent when the national factories were founded, so that men and women with a chemical training found an opportunity of putting their knowledge at the service of their country. And in not a few instances those who, for financial reasons, had at the close of their college career taken up a less congenial employment were able to return to the practice of chemistry, for which in their student days thy had specially fitted themselves.

Lack of Trained Men and Technical Data

In the foreword of the publication "Reports on Costs and Efficiencies for H.M. Factories," issued by the Ministry of Munitions, we are told "when it was decided to commence the erection of new and national factories, and an attempt was made to collect from existing factories the necessary technical data and assistance, did it become evident that, due to the extraordinary demands of the war, there was—practically throughout the entire country—a regrettable lack of available accurate technical data, and an even greater lack of trained technical men—more particularly chemical engineers." To anyone acquainted with the conditions existing in this country in pre-war days, the lack of "trained technical men" is no matter of surprise. In fact, one cannot fail to be astonished at the phenomenal development of chemical manufacture which has taken place under the directing influence of Lord Moulton, in response to the call from Army to Navy. That men were found capable of taking a part in these varied undertakings cannot, at any rate, be credited to the encouragement which the teaching of chemistry or the students of the science had received from those directing industries which employ or should employ

the services of chemists. It is no uncommon experience to find the chemist employed simply in the analytical testing of raw materials and manufactured products, and even in the working of processes under their control the potentiality of the chemist is not utilised to the full, as is evident from the following, which is a quotation from the Preface to the brochure, issued by the Ministry of Munitions, to which I have already referred :—

"Since the beginning the policy of the Department with regard to our national factories has been to aim at maximum efficiency in respect of cost and usage of materials. For this purpose the greatest efforts have been made to place before all those who are in any way responsible for control full details concerning the working and costs of the factories. This was rather an innovation in the field of chemical manufacture, as until comparatively recently, either intentionally or through negligence, it was customary at many chemical plants to keep the chemists in complete ignorance, not only of the cost at their plants, but also even of the efficiencies. It is amazing that manufacturers can expect improvements in chemical processes when their chemists are kept in ignorance of such vital facts. It has happened very often that as soon as detailed figures were seen by chemists at a plant, important alterations and improvements have at once been suggested, the need for which would otherwise never have been noticed."

The condition of service indicated in the passage quoted, together with the low scale of remuneration which obtained hitherto in chemical industries, help to explain the scarcity of the kind of scientific labour referred to in the quotation I have made from the "Foreword." But are we not told and invited to believe that all this is changed, that the records of the magnificent achievements of British chemists in the war have so educated the people, and, may we say, the Government also, that the practitioners in chemistry will no longer find it essential that in describing their vocation they should be required to add, unless for special reasons, such prefixes as "analytical," "research," "scientific," or "engineering" to the word chemist, secure in the feeling that by describing themselves as "chemists" their standing, training, and profession will be correctly understood.

Indifference of the Public

Still a feeling akin to despondency, if nothing worse, is pardonable, when realising the fundamental importance of chemistry to our industries, and the thousand and one ways chemical research has ministered to the amenities of our everyday life, there should exist, not alone in the mind of the general public, but of the educated also, such a lack of information as has been revealed during the past few years. To wit, the myth woven into the history of the production of glycerine, the confusion in the minds of legislators between phosphates and phosgene. More serious, however, is the fact that the method of investigation employed by the chemist is so little appreciated or understood as to lead one to imagine that the discoveries and achievements are the results of a species of legerdemain. The production of new colours, a succession of happy thoughts, and that "by an accident the secret of synthetic indigo was unlocked." This last is a quotation from a review entitled "The Value of Scientific Research," published some three years ago, and is typical of much that passes muster in appraising the value of chemical research. That the unravelling of the constitution of indigo which occupied Baeyer and his pupils some thirteen years, the account of these investigations covers some 180 pages of Baeyer's collected works, should be summarised in this way appeared to me to call for a protest. My protest was made, and I attempted to put the matter in the correct light, showing the synthesis of indigo to be, indeed, a brilliant example of the value of theory and of a practical illustration of the importance of the chemist's conception of the Architecture of Molecules, as exemplified by Kekulé's theory of the constitution of benzene. The protestation evoked a reply from a correspondent, signing himself D.Sc., Ph.D., who sought to justify the description of the revelation of the secret of synthetic indigo by reference to an accident which occurred in the investigation of the processes for the manufacture of phthalic acid and which certainly greatly facilitated the production of this substance, an intermediate in the manufacture of artificial indigo. So, if the initiated emphasise the unessential, why should we blame the layman and be surprised that well-ordered and planned design should appear to be but the workings of chance, for every such achievement is a witness to the conquest of well-founded theoretical speculation.

But I do not wish to conclude on a despondent note, nor is it right that I should do so, in view of the many activities operating for the promotion of scientific research, and of such evidence as that supplied by the magnificent endowment of the Chemical Department of the University of Cambridge, all of which are evidences of what we may reasonably hope to be a happy augury for the future of chemistry and chemists in this country.

Criticism from Professor Gray

Professor Gray, President of the Section of Mathematical and Physical Sciences, said that the part played by physical science in the conduct of the war had not been so decisive as it might and ought to have been. Nearly twenty years ago, after the South African War, the urgent necessity for the reorganisation of our military machinery had been demonstrated, but nothing of real importance in the way of reforming the War Office had been done. If there had been any truly scientific element in the *personnel* of the Government, attention would have been directed at a much earlier period to our hopeless state of unpreparedness. Emphasis had been placed on our lack of arms and munitions, but the entire absence of a scientific organisation to guide us in a defensive war against the most scientific and the most military nation of Europe was even more serious. This deficiency even yet had not been brought home to our military chiefs. When the war broke out, nothing had been done to ensure the utilisation for the scientific operations which war, as carried on by the Germans, involved, of the great number of young, well-trained scientific men in the country.

Outside Interference

At the end of 1915, on his suggestion, the Council of the Royal Society formed two representative committees to get a record of all the men available for special work. He himself was a member of one of these, the principal duty of which was to provide scientific men for special service. It included representatives of the various great departments actively engaged in the conduct of the war. But for some reason, which he never learned, after a week or two the committee ceased to be called. He gave examples from the modes of filling appointments in the Engineers and Flying Corps which seemed to show that there was no satisfactory provision for securing the services of men most suitable. He suggested that steps should now be taken, on the lines of his former proposal to the Royal Society, to form a record of scientific graduates for special service.

Professor Gray praised the work of the Munitions Inventions Department, but complained that when approved appliances were sent out to G.H.Q. it by no means followed that a well-informed and capable officer would be allotted the duty of explaining their action. Often quite clumsy and relatively inferior contrivances were adopted. Harm had been done by submitting thoroughly tested inventions to officers who had been engaged on similar work, and who were sometimes disposed almost to resent the "interference" of outside inventors. He believed that the real cause of the prevailing neglect of science was that almost all our political leaders were without scientific education.

Professor Gray criticised the new Committee of Scientific and Industrial Research, partly because of its bureaucratic and centralising methods, and partly because it was disposed to undervalue the importance of pure research. "I am glad," he said, "that something is being done at last for the organisation of scientific research. This movement has started well in several, if not in all, respects, and I wish it all success. There are, however, one or two dangers to be avoided, and I am not sure—I may be much too timid and suspicious—that they are fully recognised, and that the result will not be too much of a bureaucracy."

"There is, to my mind," continued Professor Gray, "too much centralisation aimed at. Everything is to be done from London: a body sitting there is to decide the subjects of research and to allocate the grants."

Pure Science

In continuing, Professor Gray said that he considered that it is in danger of being forgotten that, after all, pure science is by far the most important thing. Most of the great applications of science have been the products of discoveries which were made without any notion of such an outcome. Witness the tremendous series of results in electricity of which the beginning was Faraday's and Henry's researches on induction of currents, and the conclusion was the work of Hertz on electric waves. From the first came the production and transmission of power by electricity; from the last the world has received the gift of wireless telegraphy. In research, in pure science at least, control will inevitably defeat itself. The scientific discoverer hardly knows whither he is being led; by a path he knows not he comes to his own. He should be

free as the wind. But I must not be misunderstood. Most certainly it is right to encourage research in applied science by all available and legitimate means. But beware of attempting to control or 'capture' the laboratories of pure science in the universities and colleges of the country. Let there be also ample provision for the pursuit of science for its own sake; the return will in the future, as in the past, surpass all expectations."

The Teaching of Science

Professor H. E. Armstrong's Views

PROFESSOR H. E. ARMSTRONG opened a discussion in the Educational Science Department on the method and substance of science teaching, and made critical reference to the report of the Committee on the position of natural science in the educational system of Great Britain, which he said was not likely to influence educational opinion in any great degree. If the report proved anything, it was the necessity of the reconstruction, root and branch, of the Board of Education so that it might become an active, alert, and sympathetic body in touch with public needs and desires governed by scientific method. With the Board should be associated a small standing advisory committee of the leading active workers in education, not an unwieldy body such as was the present Consultative Committee. A parallel Committee was appointed to deal with literary subjects. Had those who appointed the Committee thought the matter out properly the two bodies would have been called upon to co-operate in preparing a joint scheme. The primary conclusion of the Committee that natural science should be included in the general course of education of all up to the age of about sixteen, was not particularly helpful. Were not teachers, he asked, controlled and hampered by a rigid, soul-killing system of examinations, largely conducted with commercial ends in view? It had been said that the London University was run on the proceeds of the Matriculation Examination!

Basis of Instruction to be Broadened

The one feature of distinction in the report was the recommendation that was made that the basis of instruction should be broadened. The universities must take the lead and give culture. The present neglect of geology was disgraceful in view of its importance in agriculture; the neglect of biology was suicidal, and meant neither more nor less than neglect of ourselves. The method of science, the scientific outlook, must be acquired if scientific knowledge was to be made of any avail. As in music and every other art, proficiency was to be acquired only by constant and laborious practice. The great majority of teachers had no understanding of the methods. They made no attempts to teach the art of inquiry, simply because they had never learnt to be inquirers themselves. The prime need of the schools was men with some originality of mind. A complete change of method in the schools could alone give the opportunity required. They must break down the water-tight compartments of subjects and join up afresh. From the outset the elements of physics must be taught as part of the mathematical training. Geography must take in the elements of geology. And the two streams should meet at an early period and develop into chemistry.

Metallurgy during the War

Professor C. H. Desch

A paper on the above subject was read on Wednesday by Professor C. H. Desch, who said that metallurgical considerations played a considerable part in bringing about the war. In the years preceding 1914 the industrial development of Germany had been proceeding at an extremely rapid rate, and at last reached a stage when they could continue only on condition that new markets were found and new sources of raw material made available. Before the Franco-Prussian War Germany was dependent on imported ores, but she then annexed Lorraine. In 1913 the output of ore from Lorraine was 21,000,000 tons, or three-quarters of the whole iron ore output of Germany. Even this was not sufficient for the rapidly-growing German industry. Further supplies were wanted from French Lorraine, and German syndicates began to work many of the deposits. The vital importance of the iron ore districts was not sufficiently realised by the French military authorities at the beginning of the war, and the effect of the German invasion was to deprive France of 63 per cent. of her iron industry. Had Germany won the war she would have annexed the whole of the French iron district.

A Former German Industry

Speaking of metallurgical changes carried through in this country during the war, Professor Desch described how Sheffield manufacturers undertook the production of tungsten and established on a secure basis an industry which had been in German hands. He also showed how our manufacturers faced the problem of using low-grade ores from Lincolnshire and other counties to make up for deficiencies in the supplies from Spain, and how special steels and alloys were developed to meet new requirements in connection with the supply of aeroplanes and tanks. The changes made, he said, involved a great deal of research, but fortunately we were well equipped for this. Great advances had been made in metallurgical knowledge. When it could be published, it would be seen that the country had done extremely well. They could not point to any very serious mistakes, and they could point to great successes. One result of the war would be a very substantial improvement in British metallurgical production.

Discussion

In the discussion which followed the paper, the necessity that manufacturers should back up the research workers was emphasized. The alternative to this, it was pointed out, was that the fruits of research would be reaped, as they had been in the past elsewhere. Mr. Cosmo Johns, of Sheffield, who has visited the left bank of the Rhine since the Armistice and made extensive enquiries about Germany's metal industries, said that no advances were made in German metallurgy during the war. Too many difficulties were in the way of her manufacturers and it was marvellous in view of the shortage of everything, with the possible exception of iron, that they struggled on so long. There was a great scarcity of copper and aluminium, and tin was entirely unobtainable owing to the blockade. The chief substitute for copper was zinc, a most unsuitable metal, which had to be used for the most extraordinary purposes. There had been considerable curiosity as to the substitute employed by the Germans for manganese, required for oxidising steel. The substitute which came to be used was calcium carbide, and almost without exception the manufacturers had not a favourable word to say about it. In some cases 30 per cent. of the shell bars produced with it had to be scrapped. The lack of essential metals and the breakdown of transport owing to the want of good bearing metal and lubricating oils were the chief things which brought Germany to the end of her resources.

The British Glass Industry

A Paper by Dr. M. W. Travers

In this paper it was stated that during the war many British glass factories were engaged to a considerable extent in producing goods and materials which had previously been imported from enemy countries, but which were equally indispensable in war or peace. Plant and labour were diverted to these special purposes; some branches of the industry in which the country had already secured a predominant position suffered severely, other branches developed, and entirely new branches of the industry were established. Furnaces and plant had been worked beyond the economic limit and were badly in need of repair before the signing of the armistice made it no longer necessary to carry on at all costs. Much of the new constructional work carried out during the war was essentially of an emergency character, carried out with war materials and at war costs. There was no little danger that while we continued to celebrate our victories we might lose the opportunity of consolidating our position. It yet remained to be proved that we could hold what had been won. The Germans had still their factories, generally in good working order, much of their trained labour and management, and, above all, a great store of knowledge and experience.

Branches Scheduled for Protection

The war had done much to dissipate the idea that success in industry depended on the possession of trade secrets. Such research as had been carried out during the war in this country had aimed rather at the solution of problems arising out of the need for producing goods previously imported, and it was difficult to lay hands on a really original discovery in connection with glass. At the moment special interest attached to certain branches of the industry which were scheduled for protection in accordance with the new trade policy. These were optical

glass, including lenses, prisms and like optical devices, scientific glassware, and illuminating glassware. The country was now practically self-supporting with regard to the manufacture of scientific hollow-ware, which included resistance glassware such as beakers and flasks, and heavy hollow-ware, such as desiccators and aspirators, and it might be hoped that the labours of the Standardization Committee of the Society of Chemical Industry, which had aimed at the standardization of chemical apparatus, had been of value to the industry. The output of lamp blown apparatus and of graduated apparatus had increased enormously, but it might be anticipated that this branch of the industry would meet with keen competition, particularly for the supply of such articles as test-tubes, which required cheap labour such as was available in Central Europe and Japan. The scientific public, critical of home-made goods, had suddenly awakened to the fact that much of the imported graduated ware was very inaccurate and were insisting on a higher quality of goods, which the British manufacturers were succeeding in supplying. Finally, it was asserted, while the industry must try to hold on to what they had won, they must endeavour to win back what they had lost. The diversion of plant and labour previously engaged in the manufacture of high-class ornamental glassware had resulted in the disorganization of a branch of the industry in which the country formerly held a predominant position.

Foreign-made Lenses

SIR ROBERT HADFIELD said that he regretted that we were still dependent on Germany and Austria for lenses of the best quality. His expert friends told him that we still had to go abroad for the best lenses, and the best lenses in his own works were of foreign make. He had given the English makers every chance to submit lenses of equivalent quality, but without a really satisfactory result.

British Association Fuel Economy

Second Report of the Committee

SOON after the Committee had drawn up its First Report, which was presented at the last meeting of the Association at Newcastle-on-Tyne in 1916, certain important developments took place in regard to the subject of its inquiry, which it seems desirable now briefly to recount.

In July, 1916, largely as a result of the work of the Committee, the Government, having at length realised the importance of the problem of fuel economy, appointed what afterwards became the Coal Conservation Committee of the Ministry of Reconstruction, under the chairmanship of Lord Haldane. Altogether seven of the then members of this Committee were invited, in their individual capacities, to serve on the Government Committee. An advance copy of the First Report was placed at Lord Haldane's disposal for the information of his Committee, which ultimately issued its Report and concluded its labours in 1918.

One of the first acts of the Coal Conservation Committee was to memorialise the Advisory Council (afterwards the Department) of Scientific and Industrial Research as to the need of a chemical survey of British coalfields, a proposal which, it may be pointed out, had originated with this Committee, and had already been strongly urged in its First Report.

Matters having thus progressed so far, and it being clear that nothing further could be done without considerable grants of money, steps were taken, with the concurrence of the Council of the Association, to ascertain the attitude and intentions of the Advisory Council for Scientific and Industrial Research towards fuel research, and in what way, if any, the work of this Committee could be assisted and co-ordinated with that of other similar bodies concerned in the matter.

On November 2, 1916, an informal conference was held at the Board of Education between representatives of this Committee and of the Advisory Council, with a view to arriving at some mutually satisfactory arrangement whereby the work of the Committee would be taken over and continued under the aegis of the new Department of Scientific and Industrial Research. It was then represented, on behalf of the Advisory Council, that it was their intention to set up, in the near future, a new Standing Committee on Fuel to organise and carry out, with adequate financial provision, the various lines of research already recommended by this and Lord Haldane's Committee, and that they desired to take over and incorporate in some way with the proposed new organisation the more active members of this Committee. Unfortunately, however, the plan then proposed for so doing (which would have been entirely acceptable to this Committee) was eventually set aside by the Department, which, in Feb., 1917, established its own Fuel Research Board on a different basis. As it soon became clear that the new Board did not desire any assistance from an outside Committee, no basis of co-operation could be arranged, although the Committee had intimated to the Director of Fuel Research its willingness to collaborate.

For a period of a year afterwards the Committee did not meet, and its work was suspended, although a nucleus of its members informally kept in touch with developments. In Oct., 1918, however, in response to a widespread and growing feeling that there was need of an organised body of independent scientific opinion that could be brought to bear, in the public interest, upon any proposals for research of public policy with regard to fuel, the Committee resumed its labours, having been empowered by the Association to reorganise its work and personnel, to enter into communication, at its discretion, with Government Departments, the Federation of British Industries, and other bodies concerned with fuel economy, and to publish from time to time through the medium of the technical Press, or otherwise, any information or recommendations in the national interest, without prejudice to the presentation of its Report to the Association. The reconstituted Committee comprised thirty instead of (as formerly) forty-five members, and the number of the Sub-Committees was reduced from five to three.

Since its reconstruction the General Committee has held four meetings, whilst the Executive has met seven times. In view, however, of the vastness and complexity of the manifold issues involved in the present coal situation, and the difficulty of formulating any definite conclusion as to the effects of the war until conditions have become stabilised once more, the Committee decided to postpone presenting any final Report until some future year. The present Report is, therefore, of an interim nature, concerning such items only as appear to warrant publication at this juncture.

Coal Outputs and Prices since 1913

In its First Report the Committee drew attention to the vital importance of relatively cheap coal to the nation's industrial prosperity, and stated that, for some years before the war the average price of coal at the pithead had been decidedly on the up-grade, a tendency which might be expected to continue at an accelerated rate. As the result of circumstances created by, or arising out of, the war, the average pithead price of coal has already almost trebled since the year 1913, and is likely to rise still higher, a matter of most serious concern to the whole nation. How basic is the necessity of relatively cheap coal to the recovery of our pre-war prosperity will at once be apparent when it is realised how absolutely dependent are all our principal manufacturing industries upon imported raw materials. Our own natural resources do not enable us to provide ourselves, in quantity sufficient for the needs of a modern industrial community, with a great variety of raw materials; nor can we grow sufficient food for our present population. But our ships can bring abundance of raw materials from all parts of the world to our coal. Without the impelling power of relatively cheap coal, we should neither be able to attract the raw materials, nor yet to build or maintain the ships in which to convey them. Relatively cheap coal is, in fact, a fundamental necessity to the maintenance, not only of our great iron, steel, engineering, shipbuilding and textile industries, but of our shipping trade and sea power.

Thus in 1913 the chief raw materials which we produced in excess of our requirements were coal, clay, and salt. By far the most important of these was coal, of which we exported 97.5 million tons valued (f.o.b.) at 52 million pounds sterling Half of the 10.5 million tons of iron smelted in our furnaces was from imported ores. We imported also the whole of the copper and cotton, 95 per cent. of the zinc, 90 per cent. of the lead, and about 80 per cent. of all the wool and timber used in British industrial establishments. In addition, we imported some 257 million pounds worth of food, drink, and tobacco.

The great need of the moment is that the true facts of the situation shall be brought home to all sections of the community The Committee, therefore, desires to draw attention to the following comparative data concerning the movement of coal prices in Great Britain and the United States duriug the war-

period. The British figures are all derived from official, or other equally reliable sources, whilst those relating to America have been extracted from the Bulletins issued by the Bureau of Labour Statistics (U.S. Department of Labour), to which the Committee desires to acknowledge its indebtedness. In converting the American prices into their English equivalents a dollar has been taken as 50 pence.

Outputs of Coal and Average Pithead Prices in Great Britain.

Year	Total Output Million Tons	Annual Output per persons employed Tons	Average Pithead Price Per Ton
			s. d.
1913	287.4	260	10 1
1914	265.6	238	10 0
1915	253.2	270	12 6
1916	256.3	260	15 7
1917	248.0	247	16 9
1918	227.7	232	(24 0)*

* Estimated.

Year	In London for Best House Coal delivered	For Gas Coal by the South Metropolitan Gas Co.		For Durham Cooking Coal at a Cleveland Ironworks.*
		f.o.b. at N.E. Coast	Cost into Works	
	s. d.	s. d.	s. d.	s. d.
1914	29 0	11 2	14 6	13 0
1915	34 3	15 5	22 11	16 2
1916	37 0	16 5	26 4	22 3
1917	38 0	16 8	32 5	22 10
1918	44 0	20 11	34 4	24 5

* The corresponding pithead prices would be about 3s. 6½d. less than these. The average price (at the works) during the first six months of 1919 has been 26s. 6d. per ton.

The upward tendency of prices has continued since the close of 1918, and, according to a recent declaration made on behalf of the Government in the House of Commons, consumers will have to face an all-round increase on the foregoing prices of 6s. per ton during the coming winter.

The Committee views with concern the recent rapid decline of the annual outputs per worker employed in British mines. During the thirty years preceding the war the returns had shown a steady decline, as follows :—

Decade	Average Annual Output per Worker. Tons
1883–92	320
1893–02	295
1903–12	280

That this downward tendency was peculiar to British mines is shown by the following comparative figures :—

Comparative Annual Outputs per Worker employed in the Mines in

Triennial Period	Great Britain Tons	Germany Tons	United States Tons
1905–7	289	248	589
1908–10	265	239	591
1911–13	254	263	651

During the war the British outputs have continued to fall at an alarming rate, until in 1918 they reached the low level of 232 tons per worker employed. In marked contrast to this, the American figures have continued to rise at an accelerated rate until in 1916 they reached 732, and in 1917 the phenomenal record of 768 ton per worker employed.

It appears, moreover, that already American fuel prices have fallen to a level considerably below those ruling in this country, a circumstance which gives American manufacturers a great initial advantage over our own.

Research on the Chemistry of Coal

Since the previous Report, Professor Bone has continued to direct the research work upon the Chemistry of Coal at the Imperial College of Science and Technology, London, which he originally undertook in 1918 at the instance of the Committee. In conjunction with Mr. R. J. Sarjant he has recently published, in the " Proceedings of the Royal Society," the results of a series of experiments upon the so-called solvent action of pyridine upon coal, to which Bedson first drew attention in the year 1899.* Since that time it has been investigated by a number of other chemists as a possible means of discriminating between the chief types of constituents of the coal substance. Wheeler and his co-workers have employed it extensively in their researches, claiming that if the portion of the coal removed by pyridine be subsequently extracted with chloroform, a complete separation of the resinic from the cellulosic constituents may be effected†. On the other hand, the independent work of Harger‡, Wahl§, Vignon‖, and others raised the question whether the action of pyridine, and other similar basic solvents, is really one of ordinary solution, and much of the evidence obtained by them suggested that it is chiefly a depolymerising one. Professor Bone's recent experiments support this latter view, and point to the conclusion that the action in question affects the coal substance as a whole, and is by no means confined to any one constituent of it. The action is retarded, in a degree which may vary considerably according to the character of the coal, by the presence either of water in the solvent or of oxygen in the atmosphere in which the extraction is carried out. In order to obtain comparable results with a series of different coals it is, therefore, necessary to operate with a carefully dried solvent, and in an atmosphere from which oxygen is excluded. Suitable means and apparatus have been devised for carrying out extractions under such precautions. It has also been shown that the action of pyridine at its boiling point (under atmospheric pressure) upon a particular coal approaches in time a practical limit which, however, may be considerably exceeded if the extraction is carried out at higher temperatures (e.g. in sealed tubes under pressure). Professor Bone and his co-workers have also devised a method for extracting in a pure condition the resinic constituents of coal, particulars of which will shortly be published.

In connection with the question of the organisation of systematic investigations upon the chemical characters of the principal British coal seams, this Committee desires to reiterate the opinion expressed in its First Report, namely " that the resources, both of existing laboratories which have been established in this country for the special investigation of fuel problems, and of other laboratories where the technique of the subject has been developed, might be utilised more than they are in this connection, and that the time is ripe for the organisation of a scheme of systematic co-operative research aided by national funds in which all such laboratories may participate."

The Committee regrets to say, however, that, notwithstanding the establishment of the Fuel Research Board, with large funds at its disposal, no attempt has apparently yet been made to organise any such comprehensive scheme as was recommended in 1916; and it wishes again to impress upon both the public and the Department of Scientific and Industrial Research the danger of sterilising fuel research by a policy of over-centralisation. On the contrary, it is of the opinion that what is most needed is a broadly-planned policy which will aim at stimulating and assisting experimental work on the chemistry of coal, fuel economy and cognate subjects everywhere throughout the whole Kingdom.

Future Gas Standards

Since the previous report, Professor Bone has continued to direct the research upon the chemistry of coal, while the Committee has had under consideration the Report issued on January 29, 1919, by the Fuel Research Board in reply to the inquiry of the Board of Trade as to " What is the most suitable composition and quality of gas and the minimum pressure at which it should be generally supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of by-products, and the purposes for which gas is now used."

Recognising that the said Report opened up important and far-reaching questions of public policy with regard to the manufacture and distribution of town's gas, the Executive, after

* Bedson, *Journ. Soc. Chem. Ind.*, 1908, p. 147.
† Clark & Wheeler, *Trans. Chem. Soc.*, 1913, 103, p. 1704
‡ Harger, *Journ. Soc. Chem. Ind.*, 1914. p, 384.
§ Wahl, *Compt. Rend.*, 1912, 154, p. 1094.
‖ Vignon, *Compt. Rend.*, 1914, 158, p. 1421.

receiving separate memoranda on the subject from Professor Bone and Mr. E. V. Evans, referred the whole matter for detailed consideration to a Sub-Committee consisting of Sir Robert Hadfield, Professor Bone, Dr. J. E. Stead, Messrs. A. H. Barker, E. Bury, E. V. Evans, D. H. Helps, D. V. Hollingworth, A. Hutchinson, R. Mond, W. H. Patchell, and H. James Yates.

This Sub-Committee having reported that it had arrived, by an eight to one majority, at the conclusions embodied in the following numbered paragraphs, they were formally adopted by the Committee as a whole, and ordered to be incorporated in the Report as the findings of the Committee on the subject.

(1) The chief recommendations made by the Fuel Research Board embody substantially the following propositions :—

(*a*) That the consumer shall in future be charged according to the thermal units in the gas actually received by him, just as a consumer of electricity is charged for the Board of Trade units which have passed through his meter.

(*b*) That, subject to a maximum limit of 12 per cent. of inert constituents, and of its undertaking to adjust consumers' lighting, heating and cooking appliances so that the gas can be burnt in them with both safety and efficiency, the gas undertaking shall be at liberty to fix the calorific value of the gas it supplies to its customers, although in the common interests of producers and consumers it is suggested that burners shall be standardised for a limited number of calorific values of gas of which (it is suggested) four grades may be sufficient, namely, 400, 433, 466, and 500 B.Th.Us. per cubic foot.

(*c*) That every supply district above a certain magnitude ought to be provided with one or more gas examiners and, if necessary, a staff of inspectors, whose whole time should be devoted to looking after the interests of gas consumers, and that the smaller supply centres should be grouped into districts for such purposes.

(*d*) That, provided customers' appliances are properly adjusted to the grade of gas supplied, it may be tentatively accepted that the relative values of different grades of gas are strictly proportional to their calorific values. Thus, for example, " the relative values to the consumer of gases of 500 and 400 B.Th. Us. could be taken as exactly in that ratio."

(*e*) That there shall be more complete removal of sulphur and cyanogen compounds from the gas.

(*f*) That, under normal conditions of supply and equipment, there shall be a pressure of not less than two inches of water in the gas at the exit of the consumer's meter.

The Committee is unable to agree with the Fuel Research Board's apparent endorsement of the proposition that the relative values of different grades of gases are strictly proportional to their calorific values.

The Importance of Methane

It appears to the Committee that, in particular, the Board's Report does not recognise sufficiently the importance of methane as a constituent of a public gas supply. Owing to the relatively narrow range of explosibility of its mixtures with air, and the low speeds at which flame is propagated through them, methane (in addition to the advantages of its high concentration of potential heat units) as a constituent has an important ' steadying ' influence upon coal gas, rendering it eminently usable for domestic purposes. Hitherto the public has been accustomed to using a gas containing 30 per cent. or more of methane, and it is important that such proportions shall not be unduly diminished. Accordingly the Committee would urge the adoption of 20 per cent. as a minimum methane content in a public gas supply intended for domestic consumption.

If the Committee's proposals in the preceeding paragraphs be adopted as safe and reasonable in the interests of domestic consumers. the gas might be sold (as proposed by the Board) on a thermal basis, subject to the following proviso :—

(*a*) That its methane content shall not be less than 20 per cent., its carbonic oxide content not more than 20 per cent., and its content of ' inerts ' not more than 12 per cent.

(*b*) That its gross calorific value per cubic foot at 60 degree Fahr. and 30 in. barometer shall not fall below 450 B.Th.Us.

Within such limits a gas undertaking would be at liberty to supply for domestic use either (*a*) ' straight ' coal gas, (*b*) ' debenzolised ' coke-oven gas, or (*c*) a mixture of 100 parts of coal gas with (up to) 50 parts of blue water gas. Where, however, gas is supplied in bulk for industrial uses only, a relaxation in the above conditions might be permitted subject to agreement as regards cost between gas undertakings and the consumers.

Benzol Recovery Disadvised

During the discussions which took place upon the question of gas standards, the attention of the Committee was called to what is known as the ' stripping of coal gas,' by which is meant the extraction of benzenoid hydrocarbons from it. This process has been instituted as a war measure in view of the necessity for providing sufficient raw material for the manufacture of high explosives.

It was pointed out to the Committee, however, that with gas selling at its present average price it would probably be of greater financial advantage to the gas undertaking to allow the benzenoid hydrocarbons to remain in the gas if the sale of gas on the proposed new thermal basis is instituted. Though fully realising the present national shortage of motor spirit, the Committee felt that gas undertakings should be under no obligation to remove benzenoid hydrocarbons unless the selling price of motor spirit would justify their doing so on financial grounds.

British Exports Credits Department Advances up to 80 per cent

THE Board of Trade announce that the Government are prepared from Tuesday, Sept. 9, through their Exports Credits Department at 10, Basinghall Street, E.C.2, to consider applications for advances up to 80 per cent. of the cost of the goods, plus freight and insurance, for goods sold to Finland, The Baltic Provinces (Latvia, Esthonia and Lithuania), Poland, Czecho-Slovakia, Jugo-Slavia, and the areas in Russia to which the scheme for insurance against abnormal commercial risks applies—subject to the following conditions :—

(1.) Documents are to be surrendered to the buyers against their acceptance of a bill in sterling drawn by the sellers for the full amount of the invoices, together with security. The Government will release the drawers from any recourse against them for the amount of the advances made ; (2.) The purchasers must agree to take up such documents against a deposit of currency, calculated on the basis of the market exchanges, such deposit to be made with an approved bank in the country of purchase, and to be held as security for the due payment of the bills ; (3.) When the advance is needed, the relative documents will have to be accompanied by a letter of guarantee from an approval bank of the country of purchase stating that the documents will be promptly taken up against such deposit of currency and undertaking that the amount of such currency shall always be maintained at a figure sufficient to give a margin of 15 per cent., over the value of sterling as based upon the exchanges (not upon the official exchanges, if any). All applications accompanied by a bankers, guarantee of sterling payment at maturity of the bill will receive preferential consideration ; (4.) The Department will consider proposals for a deposit of produce or securities instead of currency ; (5.) The advances made by the Department will be a first charge upon the proceeds of the bills and securities ; but, if such proceeds are less than the cost, plus freight and insurance, the loss represented by the difference will be divided between the Department and the drawer of the bill in the proportion of the advance made to the cost (plus freight and insurance) ; (6.) The credits are to outstand only for such periods as the Department may determine in each case at the time of application for the advances ; (7.) The Government will settle from time to time the countries and goods to which the scheme relates, but advances will not be made for the export of raw materials and preference will be given to the finance of goods where the larger part of the cost is due to manufacture in this country ; (8.) All applications must be passed to the Department by the bankers of the sellers, whose recommendation must be attached ; (9.) After satisfaction of the advance, the bill and securities will be handed to the seller if payment of the full amount of the Bill has not been made ; (10.) At any time after maturity of the Bill or after any default the Department will be entitled to close a transaction and hand over the Security held, the seller bearing his proportion, as indicated above, of any loss incurred ; (11.) The conditions set out above may be modified at any time or in special cases.

With the consent of Barclays Bank Ltd., Mr L. A. Davis, Deputy Foreign Manager of that Bank, has been appointed manager of the department.

Chemical Imports and Exports

The following figures show the value of the imports and exports of chemicals, drugs, dyes, and colours for the month, and for the eight months ended August 31, together with the increases or decreases as compared with the corresponding periods of 1917 and 1918:—

MONTH ENDED AUGUST 31.

	1917.	1918.	1919.
Imports	£2,682,254	£4,224,882	£1,773,344

A decrease of £2,451,538 as compared with 1918, and of £908,910 as compared with 1917.

Exports	£2,112,597	£2,097,181	£ 2,458,265

An increase of £361,084 over 1918, and an increase of £345,668 as compared with 1917.

Exports (Foreign and Colonial) ..	£236,356	£244,189	£358,899

An increase of £114,710 over 1918, and £122,543 over 1917.

EIGHT MONTHS ENDED AUGUST 31.

	1917.	1918.	1919.
Imports	£16,530,249	£26,483,106	£14,601,477

A decrease of £11,881,629 as compared with 1918, and of £1,928,770 in 1917.

Exports	£15,591,416	£14,969,885	£18,771,237

An increase of £3,801,352 as compared with 1918, and £3,179,821 as compared with 1917.

Exports (Foreign and Colonial) ..	£2,200,967	£1,967,186	£3,611,044

An increase of £1,643,858 over 1918, and £1,410,077 over 1917.

I.—IMPORTS AND CONSUMPTION

CHEMICALS, DRUGS, DYES AND COLOURS:	QUANTITIES.						VALUE.					
	MONTH ended AUGUST 31.			EIGHT MONTHS ended AUGUST 31.			MONTH ended AUGUST 31.			EIGHT MONTHS ended AUGUST 31.		
	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.
CHEMICALS:							£	£	£	£	£	£
Acetic Acid (other than for table use) .. .. .. *Cwts.*	7,937	9,375	5,224	75,882	62,724	50,373	53,025	49,106	14,743	461,122	419,585	209,630
Bleaching Materials .. .. ,,	109	—	—	1,574	68	2,450	174	—	—	2,041	195	10,865
Boracite, Borate of Lime, Borate of Magnesium, and Borax .. ,,	43,951	23,303	26,239	167,863	131,142	172,189	52,468	27,938	31,839	192,791	190,969	209,200
Brimstone .. .. ,,	5,645	85,050	10,565	40,475	755,073	114,789	4,989	69,587	11,545	28,577	375,959	101,858
Carbide of Calcium .. .. ,,	12,772	64,808	—	295,150	391,803	387,137	10,346	99,140	—	294,406	648,375	519,995
Coal Products, not Dyes .. ,,	5,000	72	8,813	33,868	12,974	30,477	65,139	1,225	2,280	406,222	137,521	96,056
Cream of Tartar .. .. ,,	2,262	6,428	1,651	24,897	29,952	12,235	21,508	101,257	16,257	205,985	452,389	179,630
Glycerine:												
Crude .. .. ,,	1,406	2,095	4	5,785	27,129	27,694	9,210	7,695	30	29,610	102,345	334,102
Distilled .. .. .. ,,	4,760	139	106	14,683	7,594	564	22,607	4,545	511	111,639	49,971	9,599
Potash Compounds:												
Saltpetre (Nitrate of Potash) ,,	27,700	53,956	66	252,052	258,143	121,879	61,860	123,002	169	531,550	552,394	247,962
Other Sorts .. .. .. *Value £*	—	—	—	—	—	—	21,169	43,728	32,815	216,180	248,409	206,527
Soda Compounds .. .. *Cwts.*	3,741	3,239	5,519	46,983	61,530	23,589	15,096	26,659	16,763	159,051	266,971	98,098
Tartaric Acid .. .. .. ,,	905	300	1,415	12,877	11,915	7,997	12,977	4,688	22,095	171,024	177,778	129,565
Unenumerated, including Acetate of Lime, Acetone, Muriate of Ammonia, and Sulphuric Acid .. .. *Value £*	—	—	—	—	—	—	1,057,156	2,324,318	275,269	4,584,164	13,745,795	2,945,863
DRUGS AND MEDICINES:												
Bark, Peruvian .. .. .. *Cwts.*	3,803	4,343	1,160	19,334	25,056	38,981	28,185	41,133	8,532	125,969	198,319	207,728
Quinine and Quinine Salts .. *Ounces*	674,182	75,264	496,656	3,088,527	1,328,933	3,934,568	72,791	10,260	50,402	343,217	179,066	375,661
Unenumerated .. .. .. *Value £*	—	—	—	—	—	—	160,362	285,023	351,003	1,566,304	1,824,686	2,269,118
DYE STUFFS (other than DYE WOODS) and SUBSTANCES used in Tanning or Dyeing:												
Dye Stuffs:												
Cutch .. .. *Cwts.*	2,584	5,825	2,874	28,462	31,612	27,686	4,673	16,597	5,283	54,161	79,621	78,022
Dyes and Dye Stuffs obtained from Coal Tar:												
Alizarine and Anthracene Dye Stuffs .. .. *Cwts.*	—	2	—	16	1,537	1,997	—	80	—	580	2,063	2,193
Aniline and Naphthalene Dye Stuffs .. .. ,,	3,541	3,792	3,734	37,174	32,555	29,785	122,688	119,875	104,657	1,170,411	1,147,120	956,639
Synthetic Indigo .. .. ,,	280	—	278	11,041	597	2,336	4,796	—	2,340	158,137	9,645	21,143
Other Coal Tar Dye Stuffs ,,	82	—	1	147	123	417	1,663	—	64	4,083	1,868	15,335
Extracts for Dyeing .. *Value £*	—	—	—	—	—	—	114,222	99,492	78,576	767,249	484,453	444,953
Indigo .. .. .. *Cwts.*	151	1,165	413	12,048	5,225	3,373	11,998	59,901	18,750	660,794	264,191	159,928
Unenumerated .. .. ,,	21,089	17,587	15,512	131,788	127,930	118,944	68,739	74,350	54,118	434,242	553,942	528,305
Tanning Substances:												
Bark, for Tanning .. .. *Cwts.*	93,922	68,618	35,509	219,513	476,558	260,990	85,357	63,058	25,762	198,409	448,832	210,984
Extracts for Tanning .. *Value £*	—	—	—	—	—	—	202,654	292,716	146,580	1,132,908	1,620,088	1,466,368
Gambier .. .. .. *Cwts.*	8,012	7,330	5,892	71,046	74,368	48,167	23,701	24,099	16,950	189,520	255,656	127,792
Myrobalans .. .. .. ,,	70,364	65,841	29,185	299,795	470,821	222,787	73,181	76,628	19,095	265,974	502,558	164,646
Sumach .. .. .. ,,	15,793	31,990	14,901	68,280	77,571	43,236	14,459	34,818	15,988	51,971	80,441	45,984
Valonia .. .. .. ,,	—	19,900	13,383	11,140	108,631	81,089	—	45,000	14,902	22,280	243,082	106,171
Unenumerated .. .. ,,	1,090	5,600	387	2,858	7,760	25,050	2,278	12,580	702	5,692	17,098	39,565
PAINTERS' COLOURS AND PIGMENTS:												
Barytes .. .. *Cwts.*	600	3,000	34,402	27,743	16,004	291,055	300	2,000	18,904	9,316	10,761	189,065
Nickel Oxide .. .. .. ,,	2,370	—	2,000	17,147	15,500	9,518	13,125	—	12,052	96,454	85,727	62,925
Red Lead .. .. .. ,,	—	—	285	2,345	—	387	—	—	626	5,492	—	816
White Lead .. .. .. ,,	1,340	—	16,574	37,156	4,597	64,060	3,078	—	43,580	80,538	9,448	159,567
Zinc Oxide .. .. ,,	15,781	11,481	44,933	154,340	53,582	104,306	55,168	33,878	124,981	465,748	164,578	295,561
Unenumerated .. .. .. ,,	54,893	19,246	64,388	228,698	140,805	288,329	133,486	45,930	139,352	590,519	381,526	601,272
TOTAL OF CHEMICALS, DRUGS, DYES, AND COLOURS							£2,682,254	4,224,882	1,773,344	16,530,249	26,483,106	14,601,477

IMPORTS AND CONSUMPTION—*continued.*

CHEMICALS, DRUGS, DYES AND COLOURS:	QUANTITIES.						VALUE.					
	MONTH ended AUGUST 31.			EIGHT MONTHS ended AUGUST 31.			MONTH ended AUGUST 31.			EIGHT MONTHS ended AUGUST 31.		
	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.	1917.	1918.	1919.
MANURES:												
Basic Slag *Tons*	—	—	—	—	—	—	—	—	—	—	—	—
Bones for Manure (whether burnt or not) ,,	541	658	472	3,435	2,947	2,842	6,298	16,741	6,076	34,904	67,510	36,797
Guano ,,	—	—	—	2,551	—	62	—	—	—	26,865	—	690
Nitrate of Soda (Cubic Nitre) ,,	—	—	—	1,680	300	3,654	—	—	—	36,490	6,000	95,565
Phosphate of Lime, and Rock Phosphate ,,	23,045	58,014	19,341	116,853	335,598	237,582	104,825	253,132	72,248	533,547	1,374,638	901,025
SACCHARIN and mixtures containing Saccharin or other substances of like nature or use — Imports *Ounces*	55,725	255,027	1,049	323,348	1,617,238	1,062,066	14,067	73,426	184	76,126	624,449	77,010
SACCHARIN and mixtures containing Saccharin or other substances of like nature or use — *Entered for Home Consumption* ,,	27,982	163,888	21,049	300,727	1,342,176	280,725	—	—	—	—	—	—
SOAP:												
Soft Soap *Cwts.*	—	—	—	—	—	302	—	—	—	—	—	644
Household and Laundry Soap in bars or tablets ,,	216	—	5,078	4,107	576	60,894	378	—	14,703	9,739	1,494	187,310
Polishing and Scouring Soap ,,	—	—	—	—	—	3,338	—	—	—	—	—	7,502
Powder ,,	—	—	1,320	54	16	3,660	—	—	2,447	396	112	6,623
Toilet ,,	9	84	1,114	950	1,334	9,296	96	1,806	12,752	7,408	15,732	133,333
Unenumerated ,,	—	—	26,266	8	—	68,103	—	—	57,298	43	—	136,241
ZINC, Crude, in Cakes *Tons*	7,189	4,754	5,535	37,965	45,398	67,271	404,093	253,436	231,541	2,169,682	2,325,200	2,919,646
ZINC MANUFACTURES ,,	171	44	522	3,160	2,081	2,185	17,150	4,142	36,637	300,052	216,348	167,451

II.—EXPORTS (PRODUCE AND MANUFACTURES OF THE UNITED KINGDOM)

BLEACHING POWDER — To United States of America *Cwts.*	—	—	—	—	—	1,040	—	—	—	—	—	900
BLEACHING POWDER — ,, Other Countries ,,	6,294	2,392	21,962	38,126	33,556	240,094	4,353	2,020	16,515	26,250	27,181	199,523
BLEACHING POWDER — Total ,,	6,294	2,392	21,962	38,126	33,556	241,134	4,353	2,020	16,515	26,250	27,181	200,423
COAL PRODUCTS, NOT DYES:												
Aniline Oil and Toluidine *Lbs.*	6,272	459,432	13,904	1,027,621	1,946,432	816,611	380	27,717	1,233	71,714	118,773	48,619
Anthracene ,,	44,240	—	127,902	1,754,688	2,240	905,663	168	—	644	5,920	40	4,257
Benzol and Toluol *Galls.*	1,290,696	746,868	86,475	8,327,966	6,773,492	689,105	122,005	50,405	9,714	648,693	474,232	72,265
Carbolic Acid *Cwts.*	3,717	8,986	11,245	97,042	58,240	93,796	17,338	25,537	22,727	254,574	149,098	225,467
Coal Tar, Crude ,,	77	—	1,389	1,896	134	14,342	16	—	549	359	32	5,985
,, Refined and Varnish *Galls.*	352,618	30,318	180,983	2,089,466	752,140	2,096,347	8,428	1,445	7,503	51,125	21,914	86,653
Naphtha ,,	40,663	408	45,483	238,679	88,579	416,561	3,709	105	5,889	22,318	9,812	59,852
Naphthalene *Cwts.*	14,367	21,562	1,943	141,190	149,041	50,998	18,544	31,585	3,201	165,837	214,712	67,592
Pitch ,,	59,910	238,543	156,964	4,311,390	5,832,899	9,248,063	5,810	31,370	24,651	245,199	598,080	1,211,833
Tar Oil, Creosote, &c. *Galls.*	957,467	107,451	3,040,439	10,183,139	1,916,976	8,400,305	38,486	2,322	15,883	304,958	76,253	245,474
Other Sorts *Cwts.*	22,689	26,579	29,741	299,134	114,158	159,062	20,721	36,481	26,911	278,738	157,822	208,028
Total Value ..	—	—	—	—	—	—	235,605	206,967	118,905	2,049,435	1,820,768	2,236,025
COPPER, Sulphate of *Tons*	1,678	2,495	161	28,207	35,515	29,295	106,968	160,497	8,828	1,557,863	2,232,013	1,612,108
DYE STUFFS:												
Products of Coal Tar *Cwts.*	6,506	7,724	11,870	42,404	51,760	57,977	122,463	126,306	139,923	681,708	781,965	817,484
Other Sorts ,,	7,600	880	9,017	50,785	14,167	27,827	27,907	6,424	25,540	193,367	82,461	104,151
Total ,,	14,106	8,604	20,887	93,189	65,927	85,804	150,370	132,730	165,463	875,075	864,426	921,635
GLYCERINE:												
Crude *Cwts.*	2,710	1,830	305	21,773	13,791	5,111	8,943	6,100	1,007	72,304	45,861	25,248
Distilled ,,	3,432	1,800	4,346	48,889	30,550	31,421	15,576	9,851	26,571	219,645	139,977	193,099
Total ,,	6,142	3,630	4,651	70,662	44,341	36,532	24,519	15,951	27,578	291,949	185,838	218,347
MANURES:												
Sulphate of Ammonia — To France *Tons*	10	2,032	1,600	8,259	5,074	8,093	200	38,046	41,928	155,847	104,925	184,601
Sulphate of Ammonia — ,, Spain and Canaries ,,	—	—	379	5,015	—	4,764	—	—	11,715	89,865	—	163,862
Sulphate of Ammonia — ,, Italy ,,	1,000	—	218	1,004	1,851	2,647	21,247	—	6,557	21,304	45,671	89,642
Sulphate of Ammonia — ,, Dutch East Indies ,,	—	—	3,841	6,480	—	6,329	—	—	97,953	119,648	—	162,400
Sulphate of Ammonia — ,, Japan ,,	—	—	9,502	4,050	—	11,699	—	—	184,484	72,882	—	221,628
Sulphate of Ammonia — ,, United States of America ,,	—	—	—	1,513	—	—	—	—	—	27,177	—	—
Sulphate of Ammonia — ,, British West India Islands (including Bahamas) and British Guiana ,,	1,954	2,283	46	5,177	3,030	2,571	44,809	74,248	989	109,707	97,776	76,276
Sulphate of Ammonia — ,, Other Countries ,,	4,173	811	1,754	15,024	1,922	8,615	79,801	24,703	42,512	277,072	50,099	250,987
Sulphate of Ammonia — Total ,,	7,137	5,126	17,340	46,522	11,877	44,709	146,057	136,997	386,138	873,502	298,471	1,148,396
Superphosphates ,,	361	370	451	1,697	743	1,873	2,493	2,467	4,075	9,833	4,833	17,355
Basic Slag ,,	50	—	3,411	1,403	130	6,989	300	—	11,829	5,347	402	27,619
Unenumerated ,,	1,973	2,479	5,765	17,242	22,926	21,983	23,233	26,439	68,555	161,325	244,271	298,347
Total of Manures ,,	9,521	7,975	26,967	66,844	35,676	75,554	172,083	165,903	470,597	1,050,007	547,977	1,491,717

II.—EXPORTS (PRODUCE AND MANUFACTURES OF THE UNITED KINGDOM)—*continued.*

CHEMICALS, DRUGS, DYES AND COLOURS:	QUANTITIES. Month ended August 31. 1917.	1918.	1919.	Eight Months ended August 31. 1917.	1918.	1919.	VALUE. Month ended August 31. 1917.	1918.	1919.	Eight Months ended August 31. 1917.	1918.	1919.
MEDICINES, comprising DRUGS and MEDICINAL PREPARATIONS:												
Opium, dried and powdered in the United Kingdom .. *Lbs.*	2,283	4,440	311	9,590	64,262	25,967	4,237	16,842	987	22,188	241,552	98,278
Quinine and Quinine Salts .. *Ounces.*	249,096	17,777	144,323	1,148,434	270,287	977,654	33,298	3,355	29,694	158,028	45,282	152,701
Other Sorts .. .. .. *Value £*	—	—	—	—	—	—	269,790	266,194	354,906	2,040,879	1,796,208	2,640,821
Total .. „	—	—	—	—	—	—	307,325	286,391	385,587	2,221,095	2,083,042	2,891,800
MURIATE OF AMMONIA .. .. *Cwts.*	5,846	1,756	10,843	55,754	34,056	74,743	12,740	5,164	32,416	123,642	94,725	222,123
PAINTERS' COLOURS AND MATERIALS:												
Barytes .. .. *Cwts.*	3,730	—	152	43,950	26,271	21,516	1,851	—	132	19,595	13,401	15,470
White Lead .. .. .. „	4,207	2,529	10,935	90,521	19,901	91,300	10,627	7,363	33,535	223,410	53,418	281,011
Zinc Oxide .. .. .. „	1,490	276	1,829	16,551	1,592	16,801	4,372	1,338	6,819	49,823	5,950	64,940
Unenumerated .. .. .. „	67,721	23,210	98,429	656,098	275,886	721,431	194,346	84,004	387,181	1,724,467	887,197	2,661,145
Total .. „	77,148	26,015	111,345	807,120	323,650	851,048	211,196	92,705	427,667	2,017,295	959,966	3,022,566
POTASH COMPOUNDS:												
Saltpetre (Nitrate of Potash, British prepared ..) *Cwts.*	1,221	475	5,734	6,828	10,287	24,186	3,554	1,623	16,576	20,513	32,785	74,117
Chromate and Bi-chromate of Potash.. .. .. .. „	1,134	785	1,799	5,106	2,259	4,768	7,751	8,721	15,853	35,957	25,433	46,072
Other Sorts .. .. .. *Value £*	—	—	—	—	—	—	3,639	2,368	10,086	48,050	20,493	32,800
Total .. „	—	—	—	—	—	—	14,944	12,712	42,515	104,520	78,711	152,989
SODA COMPOUNDS:							£	£	£	£	£	£
Soda Ash .. .. .. *Cwts.*	293,835	399,443	319,401	2,374,665	1,977,034	2,405,242	88,914	130,084	96,918	710,574	622,887	801,385
„ Bicarbonate .. .. „	50,213	35,439	37,802	351,020	283,062	351,621	18,211	21,798	17,278	123,209	135,270	174,004
„ Caustic .. .. „	71,451	85,346	124,710	284,535	349,439	607,867	98,618	131,849	133,245	358,287	552,069	815,980
„ Chromate and Bichromate „	11,308	4,648	9,214	65,026	53,280	44,036	34,174	19,702	24,109	198,700	175,639	122,634
„ Crystals .. .. .. „	3,967	386	17,183	71,423	11,832	154,885	2,036	113	5,725	21,653	5,388	51,837
„ Sulphate (Saltcake) .. .. „	35,792	50,034	15,416	305,235	341,041	199,079	5,911	9,118	3,165	41,796	58,820	37,850
„ Other Sorts .. .. „	66,642	46,787	44,067	382,572	375,752	369,109	60,988	64,355	51,628	303,523	461,647	464,197
Total .. „	530,208	621,883	567,878	3,834,476	3,381,410	4,131,839	308,852	377,039	332,068	1,757,742	2,011,720	2,467,887
SULPHURIC ACID .. .. .. *Cwts.*	201	3,944	14,028	17,565	19,181	27,513	599	2,498	9,164	19,866	26,459	28,016
TARTARIC ACID .. .. .. „	1,743	181	608	10,503	2,701	6,153	27,078	3,243	10,041	151,372	43,169	100,859
CHEMICALS, other sorts .. .. *Value £*	—	—	—	—	—	—	535,945	633,361	410,921	3,345,305	3,993,950	3,204,742
	—	—	—	—	—	—	2,112,597	2,097,181	2,458,265	15,591,416	14,969,885	18,771,237

III.—EXPORTS, FOREIGN AND COLONIAL MERCHANDISE

CHEMICALS:							£	£	£	£	£	£
Boracite, Borate of Lime, Borate of Magnesium and Borax .. *Cwts.*	—	199	1,062	1,215	865	4,994	—	418	2,150	1,822	2,762	8,720
Coal Products, not Dyes .. „	—	—	25	1,328	305	893	—	—	47	11,195	5,210	15,411
Cream of Tartar .. .. „	976	4,335	262	4,578	8,754	3,789	9,740	64,178	2,703	40,219	118,183	63,113
Glycerine:												
Crude .. .. „	—	—	—	—	—	10	—	—	—	—	—	150
Distilled .. .. .. „	—	—	—	—	—	—	—	—	—	—	—	—
Potash Compounds:												
Saltpetre (Nitrate of Potash) „	10,358	3,900	361	33,092	40,211	5,881	20,810	8,190	677	67,258	84,635	12,328
Tartaric Acid .. .. .. „	173	22	160	2,111	545	1,343	2,892	449	2,792	31,751	8,455	23,962
Of all other Sorts .. .. *Value £*	—	—	—	—	—	—	34,492	19,918	31,852	358,419	454,033	1,210,967
DRUGS AND MEDICINES:												
Bark, Peruvian .. .. .. *Cwts.*	2,678	4,373	5,763	10,828	13,825	18,504	19,687	41,503	42,541	72,651	130,585	135,863
Quinine and Quinine Salts .. *Ounces*	8,632	112,181	58,311	79,000	1,066,592	1,543,092	1,545	15,399	11,175	12,331	126,506	180,807
Unenumerated in Import List.. *Value £*	—	—	—	—	—	—	65,812	32,796	163,463	543,153	449,684	1,166,611
DYE STUFFS (other than Dye Woods) and SUBSTANCES used in TANNING or DYEING:												
Dye Stuffs:												
Cutch .. .. *Cwts.*	754	820	2,705	20,283	3,484	21,303	1,806	3,685	7,633	45,397	10,536	62,084
Extracts for Dyeing .. *Value £*	—	—	—	—	—	—	4,571	—	7,708	74,681	89,402	120,754
Indigo .. .. .. *Cwts.*	916	716	102	9,042	4,684	470	52,166	37,327	3,510	479,313	229,898	21,890
Tanning Substances:												
Bark for Tanning .. .. *Cwts.*	—	—	12,151	11,790	4,992	93,178	—	—	10,633	8,142	5,398	83,513
Extracts for Tanning .. *Value £*	—	—	—	—	—	—	475	—	27,746	94,782	90	160,227
Gambier .. .. .. *Cwts.*	4	—	2,162	9,911	656	12,616	12	—	5,593	24,503	2,097	29,113
Myrobalans .. .. .. „	—	—	9,198	761	4,460	57,836	—	—	9,683	556	4,749	58,962
Sumach .. .. „	17	—	372	214	—	2,796	18	—	448	214	—	3,192
Valonia .. .. „	—	—	3,731	—	—	8,914	—	—	4,548	—	—	15,991
Unenumerated .. .. .. „	—	—	2,408	2,285	—	10,864	—	—	2,750	2,283	—	13,335
PAINTERS' COLOURS AND PIGMENTS „	893	8	702	22,372	1,367	9,116	3,731	253	2,009	66,434	8,397	36,348
TOTAL OF CHEMICALS, DRUGS, DYES AND COLOURS £							236,356	244,189	358,899	2,200,967	1,967,186	3,611,844

From Week to Week

THE REGISTERED OFFICES of the Bibi Eibat Oil Co. have been removed to Worcester House, Walbrook, E.C. 4.

THE EAST RAND PROPRIETARY MINES, LTD., have removed their office to Messrs. Farrar Brothers' offices, 4 ,London Wall Buildings, E.C. 2.

THE GRANITE-CRUSHING AND GAS-PRODUCTION PLANTS belonging to Messrs. Fraser & Young, at Dalbeattie station were totally destroyed by fire last week.

IN THE UNGAVA DISTRICT OF NORTHERN QUEBEC official reports indicate the existence of almost inexhaustible deposits of iron ore.

THE EPSOM RURAL COUNCIL has obtained £5 for a pound of peppermint oil from the crop of peppermint grown at the Council's outfall works at Cobham.

A FIRE BROKE OUT, on Friday, September 5, at the premises of the British Oxygen Co., Ltd., Elverton Street, Westminster, causing slight damage in the workshop on the first floor.

40,000 CASES OF OIL were on board the Elder Dempster liner, *Nembe* (2,482 tons), which was destroyed by fire off the West Coast of Africa. The fire lasted a week.

THE LATE MR. J. W. STREET, of "The Shrubbery," 65, Banstone Road, Burton-on-Trent, retired chemist, has left estate valued at £5,877.

TRANSFER BOOKS of the Six per Cent. Preference shares of the Union Cold Storage Co. will be closed from September 15 to September 30, both days inclusive, the dividends for the half-year being payable on October 1.

MESSRS. PETER KEEVIL & SONS, LTD., point out that in the fire which occurred in their oil refinery at North Wharf only a small part of the premises was burned, the plant being untouched. Their regular deliveries of margarine will be in no way interfered with.

COUNCILLOR LAWRENCE HEAP, chemical manufacturer, Rook Hill, Stacksteads, has been elected alderman of the borough of Bacup, to fill the vacancy caused by the death of Alderman Edwin Hardman. Alderman Heap has been a member of the Bacup Town Council for fifteen years.

MR. JOHN DIXON BRUNTON, of Musselburgh, has given £1,000 to the Applied Science Department of the Sheffield University, the income from the sum to be expended yearly on a medal and premium for the best metallurgical research work done at the University during the year.

ON THURSDAY, SEPTEMBER 25, Mr. Hugh Griffiths, B.Sc., is starting a course of lectures on Chemical Engineering at the Battersea Polytechnic. Practical Chemistry will be taken on Thursdays, and Technical Chemistry on Fridays. (First Year, 7.15 p.m. to 8.15 p.m.; Second Year, 8.30 p.m. to 9.30 p.m.)

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom for the week ended September 6 were twelve. The number of bills of sale registered and re-registered was 120. Mortgages and charges registered by limited companies amounted to £298,338, the amount authorised (where stated) being £2,745,000.

A CONTRACT HAS BEEN SIGNED, states a Reuter's message from Beira, between the Mozambique Co. and the Manica Tin Trust, granting the latter all the mineral rights in an area of 300 square miles in the Chimoio district. Alluvial tin will be immediately exploited and 10 tons of concentrates are being shipped to New York aboard the *Hypatia*.

MR. E. S. SHRAPNELL-SMITH, C.B.E., who recently completed two years' voluntary work for the Government as Deputy-Director of Technical Investigations in H.M. Petroleum Executive, has resumed his seats on the boards of the Car and General Insurance Corporation and the British Automobile Traction Co., and has been appointed a director of the Hurtwood Water Co.

SEPTEMBER 13 IS PROPOSED as the date from which the Ministry of Transport shall take over from the Board of Trade and the Ministry of Health the powers and duties specified in the Ministry of Transport Act. Copies of the draft Orders in Council by which the transfers will be made, with such exceptions as may be specified in the Orders, may be obtained on application in writing to the Secretary, Ministry of Transport, Whitehall, S.W. 1.

SIR CHARLES PARSONS states that it was owing to the prevision and energy of Lord Fisher, as First Sea Lord, that the water tube boiler, the turbine and oil fuel were introduced. The speed of battleships was, as a result, increased from 17 knots before the war to 23 knots and during the war to 28 knots, and of cruisers of the *Courageous* class to 32 knots, and the British Navy was maintained in its position in the forefront of the navies of the world.

AT THE SHIPPING, ENGINEERING AND MACHINERY EXHIBITION, to be held at Olympia from September 25 until October 17, there will be an assembly, probably the largest ever shown, of water softening and purifying plants at work. The science of water treatment made remarkable progress during the war, in connection with both the needs of the army in the field and the manufacture of munitions, including explosives and chemicals. At Olympia, it will be possible to see most of the methods adopted by the military and munitions authorities to secure pure water from supplies.

AN OFFICIAL STATEMENT of the area of oil lands held by various companies operating in Mexico has been issued, showing the following acreage either owned or leased by the companies named: Mexican Eagle Gronp, 1,410,237 acres; Corona Group, 1,020,963 acres; Doheny Group, 568,692 acres; Franco-Spanish Co., 364,165 acres; Mestres Group, 170,555 acres; Penn. Mex. Fuel Co., 167,775 acres; Petroleum Exploration Co., 159,782 acres; J. G. Rees, 162,395 acres; Frias and Amor., 152,500 acres; and 291 smaller concerns, 1,259,207—making a total of 5,436,271 acres. The Mexican Eagle and Corona (Royal Dutch Shell) groups are now combined, giving them 2,431,200 acres. The Doheny, Mestres and Penn.-Mex. groups, while operating individually, are stated to be in complete accord with the Standard Oil Co.

THE COMMITTEE RECENTLY APPOINTED by the President of the Board of Trade to inquire into industrial life assurance have arranged for the first public sittings for hearing evidence to be held throughout the week beginning Monday, October 6. The scope of the inquiry will cover all policies issued by the companies and societies indicated on which small sums up to and including £50 are payable at death or at the end of specified periods; and the Committee will welcome any information and suggestions from persons who are interested in such policies, or whose experience of the business is likely to assist them in their inquiry. All communications and applications to be allowed to give evidence should be addressed to the Secretary to the Committee, Board of Trade, 55, Whitehall, London, S.W.1.

AT CLARIDGE'S HOTEL, last week, Mr. D. Elliott Alves was entertained at a dinner presided over by Senor Don Pedro C. Dominici, the Minister Plenipotentiary of Venezuela; and a solid silver-gilt service, consisting of seventeen pieces, designed and executed by the Goldsmiths' and Silversmiths' Company, was presented to him. Mr. Alves, who is well known as Chairman of the Venezuelan Oil Concessions, the Bolivar Concessions, and the British Controlled Oilfields, has come rapidly to the fore in the past six years as one of the most able and discerning pioneers the oil industry has known. The Venezuelan Oil Concessions, which owns a petroliferous area of 3,000 square miles, has attained such importance that its capital will be increased to £3,000,000 and its development and control taken over by the Shell Oil and Transport Co. Mr. Alves's huge acquisitions elsewhere in Latin-America will be developed, it is stated, by the British Controlled Oilfields, a Canadian registration with a capital of $12,500,000.

THE SWISS DEPARTMENT OF PUBLIC ECONOMY made an Order on June 26 last, remitting the issue and the visa of certificates of origin for aniline colours to the control of the Basle Chamber of Commerce. Certificates of origin as to these colours, if not emanating from that Chamber, but from other issuing offices, should bear the following words: "Délivré sur la base d'une facture visée par la Chambre de Commerce de Bâle." The Legation explain the system of export from Switzerland as follows: In order to prevent the export of foreign products under the Swiss flag, it is absolutely necessary that the origin of these goods should be controlled. As the aniline colour industry is concentrated almost exclusively in the neighbourhood of the Basle Chamber of Commerce, and as that Chamber possess a wide experience in this connection, the Department of Public Economy have now deemed it expedient to make the order quoted above. The control exercised by the Basle Chamber of Commerce affords an adequate guarantee that no productions of the colour industry of any country other than those of Switzerland will benefit by a Swiss certificate of origin.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, September 11, 1919.

TRADE continues steady, and a fairly brisk business is reported.

Values are generally maintained, and it would seem that business is settling down; at any rate in this country.

Demand continues active on export account, and some important contracts have been concluded.

There is an increased demand for alkali products on export account.

General Chemicals

ACID ACETIC.—American makers have raised their prices slightly to cover increased cost of production.

ACID CARBOLIC.—Supplies available for September/October are extremely limited, and full prices are being readily paid.

ACID CITRIC.—The market in Italy is rather firmer, owing to accumulated stocks having been cleared.

ACID TARTARIC.—Makers experience difficulty in coping with the constantly increasing demand for export.

ARSENIC.—Higher prices are being realised for spot parcels, which are becoming very scarce.

BLEACHING POWDER.—Export demand is brisker again, while the home trade demand seems to be on the increase.

CALCIUM CHLORIDE has been in fair demand, and the price is steady.

COPPER SULPHATE is stagnant, and no actual business appears to have resulted from recent inquiries.

FORMALDEHYDE.—A rapid advance has taken place during the past week owing to unexpectedly heavy demand for export. There is very little available for prompt delivery.

LEAD ACETATE.—There is more business moving in this product, and price is very firm.

MAGNESIUM SALTS.—Only a fair business is to be noted, and values are unchanged.

METHYL ALCOHOL.—The position is extremely firm, and refiners seem determined to obtain higher prices.

POTASSIUM CARBONATE.—Speculation is rife as to how long the present inflated prices will remain in force.

POTASSIUM CHLORATE.—The market is weak, and lower prices are anticipated.

POTASSIUM PRUSSIATE is easy, with only a small business passing.

SODIUM HYPOSULPHITE.—Although prices are reported to be ruling easier, there does not appear to be any surplus production

SODIUM ACETATE is slow of demand, but price is without change.

SODIUM BICHROMATE is in continued request. Stocks in second hands appear to have been absorbed.

SODIUM NITRITE.—The price is maintained, although business is on the quiet side.

SODIUM PRUSSIATE is again firmer, and some good business is reported.

ZINC SALTS.—There has been an improvement in the demand for sulphate, but chloride still remains dull.

Heavy Coal Tar Products

The market is steady, and a moderate amount of business is being done.

BENZOL.—There is some irregularity in the prices of this article, but the home demand continues good, and the values for motor purposes are maintained. Ninety per cent. for export is still quoted at 1s. 11½d. f.o.b., but lower prices have been accepted.

CREOSOTE is still in good demand, and business has been done in the North at 5½d. per gallon, for good quality; while 5½d. to 6d. per gallon is still quoted in the South.

CRESYLIC ACID.—The demand is not so active, and although there is no change in the quotations, business is limited. To-day's prices are: 2s. 6d. per gallon for pale, 97 per cent.; and 2s. 2d. to 2s. 3d. for dark, 95 per cent.

NAPHTHALENE.—The market is inactive, without change in price.

PITCH.—There is still a good demand, and last week's prices are maintained: 80s., f.o.b., London; 75s., f.o.b., East Coast; 72s. 6d., f.o.b., South Coast; 62s. 6d. to 65s., f.o.b., West Coast.

SOLVENT NAPHTHA is still in good demand at 2s. 3d. to 2s. 4d. in London; 2s. 1d. to 2s. 2d. in the North.

Sulphate of Ammonia

Owing to the difficulty of obtaining permits, the market for export is inactive, but prices in the home trade are without change.

Coal Tar Intermediate Products

ANILINE SALT.—In consequence of short supplies of pure hydrochloric acid, makers have been compelled to raise prices.

ANILINE OIL remains steady, with good demand for export.

ANTHRANILIC ACID is freely offered from the States, where production is now on a large scale.

Current Prices

Chemicals

September 11, 1919.

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone, pure	ton	95	0	0	to	97	0	0
Acid, Acetic, glacial, 99-100%	ton	82	10	0	to	84	0	0
Acetic, 80% pure	ton	65	0	0	to	67	10	0
Carbolic, cryst. 39-40°	lb.	0	0	9½	to	0	0	10
Citric	lb.	0	4	4	to	0	4	5
Lactic, 50 vol.	ton	66	0	0	to	68	0	0
Lactic, 60 vol.	ton	83	10	0	to	85	0	0
Oxalic	lb.	0	1	2½	to	0	1	3
Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Tannic, commercial	lb.	0	2	9	to	0	3	0
Tartaric	lb.	0	3	2	to	0	3	3
Alum, lump	ton	17	10	0	to	17	15	0
Aluminium, sulphate, 14-15%	ton	13	10	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	17	0	0	to	17	10	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
Ammonia, .880	ton	32	10	0	to	35	0	0
Ammonia, carbonate	lb.	0	0	6½	to		—	
Ammonia, muriate (galvanisers)	ton	45	0	0	to	46	0	0
Ammonia, nitrate	ton	55	0	0	to	57	10	0
Ammonia, phosphate	ton	112	0	0	to	115	0	0
Arsenic, white, powdered	ton	57	0	0	to	59	0	0
Barium, carbonate, 92-94%	ton	12	0	0	to	13	0	0
Chloride	ton	24	10	0	to	25	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	13	10	0	to	14	0	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	21	10	0	to	22	10	0
Chloride	ton	8	10	0	to	9	0	0
Casein, technical	ton	78	0	0	to	80	0	0
Cobalt oxide, black	lb.	0	7	9	to	0	8	0

	per	£	s.	d.		£	s.	d.
Copper sulphate	ton	44	0	0	to	45	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom Salts (see Magnesium Sulphate).								
Iron perchloride	ton	32	0	0	to	34	0	0
Iron sulphate (Copperas)	ton	4	15	0	to	4	17	6
Lead acetate, white	ton	82	10	0	to	85	0	0
Carbonate (White Lead)	ton	51	0	0	to	55	0	0
Nitrate	ton	58	0	0	to	59	0	0
Lithophone, 30%	ton	44	0	0	to	45	0	0
Magnesium chloride	ton	15	0	0	to	16	0	0
Carbonate, light	cwt.	3	0	0	to	3	5	0
Sulphate (Epsom salts commercial)	ton	11	10	0	to	12	10	0
Sulphate (Druggists')	ton	17	0	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	0	to	0	12	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	93	0	0	to	95	0	0
Chlorate	lb.	0	1	1	to	0	1	2
Meta-bisulphite, 50-52%	ton	210	0	0	to	220	0	0
Nitrate refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	3	3	to	0	3	6
Prussiate, yellow	lb.	0	1	10	to	0	1	11
Prussiate red	lb.	0	6	0	to	0	6	3
Sulphate 90%	ton	33	0	0	to	35	0	0
Salammoniac, firsts	cwt.	4	0	0				
Seconds	cwt.	3	15	0				
Sodium acetate	ton	53	0	0	to	55	0	0
Arsenate, 45%	ton	60	10	0	to	62	0	0
Bicarbonate	ton	9	10	0	to	10	0	0
Bisulphite, 60-62%	ton	31	0	0	to	32	0	0
Chlorate	lb.	0	0	7	to	0	0	7½
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	23	0	0	to	24	0	0
Hyposulphite, commercial	ton	18	0	0	to	18	10	0
Nitrite, 96-98%	ton	57	0	0	to	59	0	0
Phosphate, crystal	ton	25	0	0	to	25	10	0
Prussiate	lb.	0	0	7½	to	0	0	8
Sulphide, crystals	ton	15	10	0	to	16	0	0
Sulphide, solid, 60-62%	ton	22	0	0	to	22	10	0
Sulphite, crys[t].	ton	11	0	0	to	11	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
„ Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	38	0	0	to	40	0	0
Tetrachlorethane (Westron)	ton	60	0	0	to	65	0	0
Tin perchloride, 33%	lb.	0	2	4	to	0	2	5
„ Protochloride (tin crystals)	lb.	0	1	9	to	0	1	10
Trichlorethylene (Westrosol)	ton	75	0	0	to	80	0	0
Zinc chloride 102 Tw.	ton	22	0	0	to	23	0	0
Chloride, solid, 96-98%	ton	60	0	0	to	62	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	6	to	0	2	9
Aniline oil, drums free	lb.	0	1	1	to	0	1	2
Aniline salts	lb.	0	1	5½	to	0	1	6½
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	3	9
Benzidine, base	lb.	0	5	6	to	0	6	0
Benzidine, sulphate	lb.	0	4	9	to	0	5	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	1	9	to	0	2	0
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	8	0
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	2	0	to	0	2	3
Dinitrotoluol	lb.	0	1	10	to	0	2	0
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	0	to	0	3	3
H-Acid	lb.	0	7	6	to	0	8	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	3	6	to	0	3	9
Naphthylamin-di-sulphonic acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	6
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3

	per	£	s.	d.		£	s.	d.
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	1	10	to	0	2	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	6	0	to	0	7	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	6	to	0	2	8
Salol	lb.	0	4	9	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	2	to	0	1	3
Tolidine, base	lb.	0	9	0	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Miscellaneous and Paint Materials

Barytes	ton	11	0	0	to	13	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipated (light)	ton	20	0	0	to	24	0	0
Chalk, precipated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Cornwall)	ton	1	12	6	to	3	12	6
Coke (blast furnace)	ton	3	15	0	to	4	0	0
Coke (foundry)	ton	3	15	0	to	4	5	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake	ton	43	10	0	to	45	10	0
Lead, red	cwt.	2	2	6	to	2	7	6
Lead, white	cwt.	2	11	0	to	2	15	0
Ultramarine	ton	85	0	0	to	105	0	0
Prussian Blue	cwt.	11	0	0	to	11	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	8	0	0	to	10	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30%	lb.	0	1	5	to	0	1	6

The Calendar

Sept. 16-18	James Watt Centenary Celebration	Birmingham.
18-19	Iron and Steel Institute ... (Annual Meeting.)	Institution of Civil Engineers, S.W.
24-25	Institute of Metals ... ... (Annual Meeting.)	Sheffield.
Oct. 1	Eastern Counties' Gas Managers' Association (Annual Meeting.)	Salisbury House, London Wall, E.C.
3	Society of Chemical Industry (Manchester Section.) Chairman's Address, and Paper by Mr. J. Allan (Some Notes on the Rhineland Chemical Works.)	The Grand Hotel, Manchester.

Mr. Zimmer's Articles

We regret that, owing to the heavy pressure upon our space, we are obliged to hold over the third instalment of Mr. Zimmer's articles on "The Mechanical Handling of Chemical Materials" until next week.

THE CUMBERLAND COAL, POWER, AND CHEMICAL CO., of which Mr. Barton, late chairman of the Nitrogen Production and Carbide Co., is head, have acquired the Oughterside Colliery and By-product Coke Ovens on cash basis of £7 10s. for each of 5,000 ordinary shares of £5 each, constituting the vendor's capital.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

BOILERS. Coke firing of boilers during the war. *Gas World (Coking Sect.)*, September 6, 96-97. An account of some recent experiences in Germany.

COKING. An American by-product coking plant. D. MacArthur. *Gas World (Coking Sect.)*, September 6, 94-96. A description (from *Gas Age*) of the plant of the Seaboard By-Product Company, New Jersey.

CONCRETE. Burnt earth concrete with iron and wood reinforcement. L. P. Hodge. *Engineering*, September 5, 302-304. A paper dealing with the replacement of stone by burnt earth and of iron by wood in concrete construction.

EXPLOSIONS. Effect of carbon dioxide when present in inflammable gaseous mixtures on explosion phenomena. W. T. David. *Engineering*, September 5, 300-302. Interesting experiments are recorded.

FOOD. Problems of food and our economic policy. H. E. Armstrong. *J. Roy. Soc. Arts*, September 5, 653-662. The first of a series of Cantor Lectures.

GAS. Low-grade gas. W. Cranfield. *Gas World*, September 6, 178-184. A report of the William Young Memorial Lecture delivered at Edinburgh on September 4.

Steaming horizontals. R. J. Rew. *Gas J.*, September 9, 557-558. An account of eighteen months' steaming experience at Exeter.

GERMANY. Some chemical plants in the Cologne area. Part II. A. J. Allmand. *J. Soc. Chem. Ind.*, August 30, 303-304R. A description of the plant of the Elektro-Metallurgische Werke at Horrem and of the Act.-Ges. für Stickstoffdünger at Knapsack.

PYROMETRY. Tin as an ideal pyrometric substance. E. F. Northrup. *Engineering*, September 5, 309-310. A paper read before the September meeting of the American Institute of Mining and Metallurgical Engineers.

RUBBER. Eight years' work on synthetic rubber. *India Rubber J.*, August 16, 23 and 30, September 6, 305-308, 348-350, 391-395, 433-436. A translation from *Gummi-Zeitung*, containing an account of recent work in Germany.

TEXTILES. Mechanical and physical tests for textile fabrics. R. H. Pickard and R. W. Wallace. *J. Textile Inst.*, September, 240-244. Machines for making impact and stress tests of fabrics are described.

WOOD. The rapid seasoning of "Jarrah." A. Tomlinson. *Engineering*, September 5, 323-325. (Conclusion of paper noted in CHEM. AGE, p. 338.)

Colonial

ACETIC ACID, ETC. Work of the Canadian Electro Products Co. in the synthetic production of acetic acid and acetone from calcium carbide. H. W. Matheson. *Canadian Chem. J.*, August, 258-261. A review of work carried out at Shawinigan Falls since 1915.

ACETYLENE. R. A. Witherspoon. *Canadian Chem. J.*, August, 250-253. A general account of the properties and industrial applications of acetylene.

ALUMINIUM. The manufacture of aluminium at Shawinigan Falls. *Canadian Chem. J.*, August, 273-274. The plant of the Northern Aluminium Co. is described.

CALCIUM CARBIDE. The Canada Carbide Co., Ltd. J. C. King. *Canadian Chem. J.*, August, 262-264. A brief history of the carbide industry and an account of its development at Shawinigan Falls.

ORGANIC COMPOUNDS. Commercial synthesis of organic compounds from acetylene. M. J. Marshall. *Canadian Chem. J.*, August, 254-257. A review of the possibilities of manufacturing aldehyde, acetic acid and their derivatives, chlorohydrocarbons, acetylene black, etc.

SHEEP DIPS. Dips and dipping. H. H. Green. *S. Afr. J. Ind.*, July, 610-628. The author deals with the composition and manufacture of various dips.

French

ALGERIA. Resources of the French Colonies. I., Algeria. *Rev. Prod. Chim.*, August 31, 421-429. A statistical review of chemical and other trade in Algeria.

GAS WARFARE. Poisonous gases. *Monit. Scient.*, July-August, 149-158. A short account of poison gases, with special reference to mustard gas.

German

HYDROGEN. Production of hydrogen from carbon monoxide and hydrated lime. W. H. Engels. *J. Gasbeleucht*, August 23, 477-483. A study of the production of hydrogen from water-gas and lime.

HYDROGEN SULPHIDE. Titrimetric estimation of hydrogen sulphide in gaseous mixtures. E. Czakó. *J. Gasbeleucht*, August 23, 483-486.

POTASH. Recovery of potash from cement and blast-furnace dusts. *Stahl u. Eisen*, August 14, 930-931. A short review of the possibilities in America.

Rio Grande's Imports

A LIST of the chief normal requirements of Brazil, together with some notes on the countries of origin recently received from the British Consul at Rio Grande, includes cement, chemicals and drugs, disinfectants, perfumery, hides and skins, greases, oils and varnishes.

For many years nearly all the cement imported was German and Belgian, and the Germans gradually reduced the weight of the barrel (cement being sold by the barrel) to 100 and even 90 kilos, so that it might appear cheap. Of late years British cement has been coming into favour again and has been imported in barrels of 150 and 180 kilos. During the last four years there has been a considerable import of American cement, in part owing to the preferential abatement in the duty of 20 per cent., which makes a difference of about 700 to 800 reis in the cost. There are now cement factories in Uruguay and in Argentina, and a company is being promoted to establish a factory in Brazil. It is likely that the supply of barrels may prove a problem to these.

Importation of chemicals and drugs has been principally from Germany and France, and in small degree from Great Britain. Caustic soda and soda ash have come almost exclusively from Great Britain, but during the war the United States have been the principal suppliers. Creoline has had a large sale, but there are now native imitations, one of which is called Creol. French perfumery is preferred. A well-known English soap meets with some favour; the duty on this is almost prohibitive. The native-made soaps are very inferior.

Trade in hides and skins was formerly in the hands of the British, Liverpool and Bristol being the principal emporiums. The trade gradually fell into the hands of the Germans, and nearly all the hides from this State were exported to Antwerp and Hamburg.

Greases and lubricating oils have come from the United States, varnishes from the United Kingdom; but, like innumerable other articles these have, since the war, been coming from the United States.

THE BOARD OF TRADE announces that the statement which has appeared in the Press as to the control of the Department of Overseas Trade is unauthorised and incorrect. The Department remains under the joint control of the Foreign Office and the Board of Trade, and any arrangements made as regards housing will not affect this joint control.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. Lists of patent applications and of "convention" specifications open to inspection before acceptance are added; abstracts of the latter appear as soon as possible thereafter.

Abstracts of Complete Specifications

122,402. Artificial Fuel Composition and Process. R. F. Dalton, 722, Coster Street, New York. International Convention date (U.S.A.), January 12, 1918.

Commercial anthracite coal dust or screenings is mixed with a liquid fuel of high boiling point and low viscosity at ordinary temperatures in such quantity as to bind the coal dust without rendering the mixture impervious to air. The binder preferred is water gas tar in the proportion of ten gallons to one ton of coal dust. The binder must have a sufficiently high boiling point to ensure that a substantial amount remains when the mixture is near the ignition point of the coal after delivery to the fire-bed.

130,626. Metal Chlorides, Manufacture of. W. Heap, 233, Wellington Road North, Heaton Chapel, and Dr. E. Newbery, Manchester University. Application date, January 29, 1918.

Chlorides of aluminium, magnesium, cerium, or other rare earths are obtained in the anhydrous condition by the action of phosgene gas on the oxide, the reactions being of the type—

$$Al_2O_3+3COCl_2=2AlCl_3+3CO_2.$$

Aluminium hydrate may be dehydrated in a muffle furnace, and then heated to 350° to 400° C. in a current of phosgene. The aluminium chloride passes over with the phosgene and is condensed. In the case of magnesium chloride the temperature necessary is 500° to 600° C. A mixture of carbon monoxide and chlorine passed over a catalyst, such as animal charcoal, may be used in place of phosgene, and the metallic oxide may be replaced by the hydrate, carbonate or oxalate. The process may also be used for dehydrating the hydrated chlorides of the above metals.

130,650. Acetic Aldehyde from Acetylene, Preparation of. The Compagnie des Produits Chimiques d'Alais et de la Camargue, 12, Rue de Roquepine, Paris. International Convention date (France), January 12, 1917.

Acetic aldehyde is prepared by the hydration of acetylene by means of a catalyst consisting of an acid solution of a mercury salt. The reaction is conducted under vacuum, so that the acetic aldehyde is removed as it is formed. The vacuum is maintained in a receiver, which is connected in a closed circuit with the reaction vessel, so that a continuous circulation of the liquid is maintained.

130,651. Acetic Acid, Preparation of, by Means of the Oxidation of Acetaldehyde. The Compagnie des Produits Chimiques d'Alais et de la Camargue, 12, Rue de Roquepine, Paris. International Convention date (France), March 6, 1917.

Acetaldehyde is oxidised in a tower by means of oxygen or air, without a catalyst, and the liquid product flows immediately into a vessel maintained at 100° C. Any peracetic acid contained in the acetic acid thus formed is immediately converted into acetic acid at this temperature.

130,654. Gases, Removal of Sulphur and Sulphur Containing Bodies from. Dr. E. K. Rideal, 28, Victoria Street, Westminster, and Dr. H. S. Taylor, 41A, Golder's Green Road, London, N.W. 4. Application date, March 2, 1918.

In order to remove sulphur from coal gas, water gas, producer gas, or the like, the gas is mixed with water vapour in sufficient quantity and passed over a catalyst, such as oxide of iron mixed with one or more of the oxides of chromium, nickel, cobalt, cerium, thorium, zirconium, manganese, or molybdenum. As an example, iron oxide with about 15 per cent. of chromium oxide may be used, at a temperature of 300° to 650° C. The quantity of water vapour should be sufficient to prevent reduction of the oxide. The sulphur is converted into hydrogen sulphide, which is not absorbed by the catalyst.

130,660. Acetic Anhydride, Manufacture of. H. Dreyfus, 8, Waterloo Place, London, S.W. 1. Application date, March 4, 1918.

Acetic anhydride is made by the action of sulphur trioxide on sodium acetate. The trioxide is diluted with an inert gas, and may then be cooled down to a temperature of 0° to —20° C. without solidification, so that it may be used for the reaction at this temperature in gaseous form. The mixture of sulphur trioxide, nitrogen, and oxygen obtained by the contact process may be used in this manner.

130,680. Gas or Vapour, Apparatus for Treating Material with. F. L. Slocum, 401, S. Linden Avenue, Pittsburgh, Pa., U.S.A. Application date, March 13, 1918.

The material is contained in shallow trays, which are arranged in tiers in a rack or carriage having open sides and mounted on rollers. An external supporting floor is arranged level with the floor of the heating chamber, so that the carriage may be readily moved into or out of the heating chamber by means of a ram. The trays holding the material are perforated at the bottom, and are provided with sheets of wire mesh to prevent loss of material. The apparatus is particularly applicable for the treatment of calcium carbide with nitrogen, and the treatment of the compounds so formed with steam.

130,693. Nitrogen of the Atmosphere, Fixation of. R. Pearson, Jewin House, Jewin Street, London, E.C. 1, and H. C. Parkes, Salisbury House, London Wall, London, E.C. 2. Application dates, March 15, 1918, and July 8, 1918.

A mixture of nitrogen and oxygen is subjected to the action of a catalyst, such as platinum black or platinum asbestos, above 300° C., and at the same time is subjected to the action of electric sparks. The catalyst may be heated by the sparks or may be immediately in front of or behind the sparks in the gas passage. The issuing gas contains about 10 per cent. of its volume of oxides of nitrogen.

130,699. Fuel Oils. Dr. F. Tinker, 4, Gladstone Road, Erdington, Birmingham. Application date, March 18, 1918.

Comprises a method of utilising tar or tar oils containing pitch in conjunction with mineral oils as a fuel. The two oils are caused to mix without precipitation of pitch by the addition of a third ingredient which is miscible with both, and is intermediate in properties, and which has also a surface tension intermediate between those of the oils to be mixed. Such an ingredient may be found naturally, or a mineral oil may be treated so as to modify its properties as required. Methods are given for treating various natural oils by oxidation, partial distillation, &c., so as to modify their hydrogen, oxygen, nitrogen, or sulphur content, and their surface tension, as required.

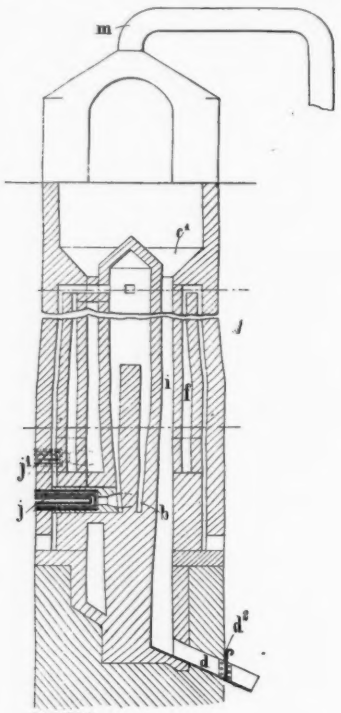
130,712. Sulphuric Acid, Production of. K. B. Quinan, Somerset West, Cape Province, South Africa. Application date, May 17, 1918.

The gases produced by burning sulphur are passed through a dust separator to a tower, which is supplied with acid from the denitrification section of the plant. The gases then pass through chambers successively, in which sulphur trioxide is formed and removed, the lower oxides of nitrogen are oxidised and absorbed by acid, and nitro-sulphonic and nitrosyl-sulphuric acid are formed. The liquids to be treated with the gases are distributed over a permeable diaphragm, and the gas is bubbled through it under such conditions that percolation of the liquid through the diaphragm is avoided.

130,755. Drying Powdered Material. A. C. Ionides, Jun., 34, Porchester Terrace, London, W. 2. Application date, August 6, 1918.

The apparatus is designed for drying powder, such as hydrate of alumina, by means of gaseous firing. The powder is fed into

the hopper c^1, where it is partly dried by the heated walls, and then passes into the passage i, which is gradually diverging. This passage is heated by gas burners j, j^1, which deliver their hot gases into the inner space b and outer space f respectively. Sufficient air is delivered to the burners for complete combustion of the gas. The temperature in the passage i gradually increases downward, so that when the material reaches the passage d it



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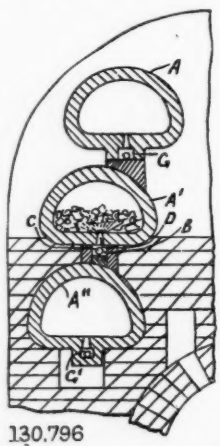
is dried and dehydrated. The partly cooled powder readily flows out from the passage d when the slide d^2 is opened, while the material in the hotter zone is cohesive. The material then gradually moves downward to refill the passage d, when a further portion of the fully treated and cooled material is ready for discharge. The vapour evolved passes through the pipe m, and any entrained material may be recovered from it. The operation of the apparatus is continuous.

130,796. Gas Manufacture. R. M. Simpson, Buckie, Banff, and G. R. Hislop, Jun., Underwood House, Paisley. Application date, August 17, 1918.

To produce water gas by the introduction of steam into hori-



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zontal gas retorts a chamber B, G, or G^1 is provided, extending along the floor of the retort A A^1, or A'', and just below it. Each chamber has a longitudinal steam pipe C, which is perforated or provided with short nozzles directed upwards. The steam passes into the retort through bevelled slots D in the floor. Various constructions of the longitudinal chamber containing the steam pipe are described.

130,816. Electric Arc Furnaces. J. Bibby, 56, Kingsway, London, W.C. Application date, September 2, 1918.

The primary of a transformer is connected in series with the main conductor to the electrode, and the primary of another transformer is connected in parallel with the arc. The secondaries of the two transformers are placed in series in the arc-regulating circuit, so that the induced voltages act differentially. This arrangement permits the electrode to be fed automatically toward the material until in contact with it. The consequent reduction of resistance in the material influences the shunt transformer and reduces the induced voltage, and thus increases the effective voltage of the series transformer since the two are in opposition. The electrode is thus raised and the arc struck. The electrode is raised to a point at which the control device is in equilibrium.

130,844. Sodium Permanganate, Manufacture of. D. Tyrer, Parkfield Works, Stockton-on-Tees. Application date, October 9, 1918.

Barium manganate is suspended in water, and sulphuric acid added very slowly at first, so that free permanganic acid is present during the reaction. Alternatively a solution of barium permanganate previously prepared is added to the barium manganate before the addition of sulphuric acid. The solution of barium permanganate is then treated with sodium carbonate or sulphate, and the resulting solution of sodium permanganate is evaporated until it solidifies completely on cooling.

Latest Notifications.

131,870. Synthetic ammonia, Transformation of—into a transportable product directly utilisable for agriculture in conjunction with the production of carbonate of soda. L'Air Liquide Soc. Anon pour l'Etude et l'Exploitation des Procedes G. Claude. August 24, 1918.

131,881. Waste sulphite of soda and its derivatives, Utilisation of—in the manufacture of soaps. J. Morel. August 28, 1918.

131,887. Melting furnaces and crucibles, Lids for. Akt. Ges. Brown, Boveri, et Cie. August 23, 1918.

131,896. Iron and metals of the chromium group, Alloys of. Deutsche Molybdaan-Werke Ges. November 25, 1916.

131,897-8. Molybdenum compounds, Extraction of—from yellow lead ores. Deutsche Molybdaan-Werke Ges. May 23, 1916, and October 2, 1916.

International Convention Specification Open to Inspection

129,292. Liquefying Gases. M. Zack, 24, Plattenstrasse, Zurich, Switzerland. International Convention date, May 30, 1918.

The gas is compressed and cooled, and then expanded while doing external work. The gas is then further expanded without external work, then compressed isothermally, and finally expanded again without external work.

Specifications Accepted, with Date of Application

118,284. Rotary Kilns, Devices for Removing Crust Formation in. M. Vogel-Jorgensen. February 28, 1917.

127,585. Artificial fuel. American Linseed Co. July 17, 1917.

131,006. Wood, Woody Fibre, Peat, and Similar Carbonaceous Substances, Destructive Distillation of. P. Poore. September 17, 1917.

131,017. Ammonium Nitrate, Production of. C. W. Bailey, H. S. Denny, and A. T. Jefferis. March 20, 1918.

131,029. Nitric Acid, Production of. K. B. Quinan. March 27, 1918.

131,049. Ammonia, Synthetic Production of. E. B. Maxted. April 4, 1918.

131,061. Electric Furnaces. J. A. Fleming. April 9, 1918.

131,091. Hydrogen, Liberation of—from Mixtures containing it. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procedes G. Claude. November 17, 1917.

131,095. Kilns for the Incineration of Earth Matters and Dolomites, Limes, and Cements. T. Hodson. May 7, 1918.

131,105. Distillation, Gasification, and the Like of Carbonaceous Materials and Separation of the Volatile Matter therefrom. W. E. Davies. July 3, 1918.

131,125. Gas, Process for Removing Tar from. O. A. L. Heise. August 10, 1918.

131,126. Gas Producers, Fire Grates for. O. A. L. Heise. August 10, 1918.

131,127. Gas Generators, Preheater for. O. A. L. Heise. August 10, 1918.

131,169. Gas Producers. H. V. Senior and A. D. Bates. August 22, 1918.

131,179. Drying, Carbonising, Roasting or the like Treatment of Materials. Erith's Engineering Co., and C. Erith. August 29, 1918.

131,198. Filters for the Purification of Liquids. F. P. Candy. October 2, 1918.

Import Restrictions

To the Editor of THE CHEMICAL AGE.

SIR,—I notice complaints in some quarters that the restriction of the import of fine chemicals has forced up prices against the consumer, and the case of Salicylic Acid and Salicylates is referred to as proof of the contention.

May I be allowed to point out that just prior to the restriction, English makers of these particular products were obliged to sell at below their cost of production in order to compete with foreign Salicylic Acid and Salicylates "dumped" into this country, and offered for sale at prices lower than those ruling in the country of origin.

One of the chief objects my company has had in view in urging the restriction of the import of certain fine chemicals is to secure to the British manufacturer a reasonable margin of profit, and makers cannot be blamed if they now secure this with the object of so establishing their business as to be in a position to compete with all comers when the import restriction is removed. Manufacturers know quite well that the unreasonable forcing up of prices against the consumer would only result in again opening the market to the foreign competitor. Manufacturer and consumer, wholesaler and retailer, surely realise that import restrictions are only a means to an end, viz., the ultimate establishment of important "key" industries within the British Isles, on such a scale as to be proof against all foreign competitions. If this commendable object is kept constantly in mind it would not be difficult to adjust business to meet the new conditions without inflicting hardship in any quarter.—Yours, &c.

RALPH J. PUGH.

London Chemical Works, Ltd.,
Scotts Road, Southall, Middlesex.
September 5.

"Vaseline"

To the Editor of THE CHEMICAL AGE.

SIR,—We notice on page 107 of your issue of July 12, in your report of the English and Foreign Oil Finance, Ltd., that our trade mark "Vaseline" is used as though it were the name of an article. Doubtless this is an oversight on the part of the speaker, and we shall be much obliged if you will call the attention of the gentleman to this, as we do not know his address. Thanking you in anticipation.—Yours, &c.,

CHAS. F. EMERY,
General Manager.

Chesebrough Manufacturng Co., Consolidated,
42, Holborn Viaduct, London, E.C. 1.

[The word "Vaseline," although unknown fifty years ago, is one of the most popular throughout the whole world to-day, but at the same time there are still a great many people who have yet to learn that the word is a registered trade mark, and the exclusive property of the Chesebrough Manufacturing Co., of New York, London, Moscow, Montreal, &c. We shall be pleased to comply with Mr. Emery's request, and will forward a marked copy of this issue to the Chairman of the company referred to.—ED. *C.A.*]

A NEW DISCOVERY of silver bearing lead is reported from Nigeria. The belt is said to be about 50 miles in length, and ore bodies have been located up to a width of 50 ft.

What will become of England?

A Warning from America

MR. CHARLES A. EATON, an American, who is well known in connection with his propaganda work during the war, contributed an article to a recent issue of *The Times*, in which he discussed the problems facing England. "I have," he says, "been greatly impressed by the many signs that England will suffer this winter from lack of fuel. According to an English authority the average yearly output for a British miner is 226 tons, while for an American miner it is three times that amount. These figures raise the question not as to what will become of the miner or the mines, but what will become of England. An American contractor is erecting rolling mills in England. From the same blue prints he has let contracts in Pittsburg, Youngstown, Ohio, and in England. He is paying 50 per cent. more for the same article made in England, for use in England, than he pays for it in Youngstown. And the workman there is receiving 30 per cent. higher wages than here.

"If I were an Englishman I should be gravely concerned over these facts. The English working man is as good as the best. In mining and the steel industry he is not competing with men of his own breed, except in part; for a large proportion of the iron and mine workers of America are from central and southern Europe. Why should a Pole or Slav in America mine more coal or produce more steel products than an Englishman in England? Is it a question of machinery or method, or is it a state of mind?

"I would not venture an opinion upon matters at issue between miners in England and their employers, but as a general policy for this time I can see only one thing for any man who loves his country, and that is to get to work and stay at work until the danger is past.

"I shall follow with eager interest the proposal to nationalise British mines. In America many of us used to believe that the Government could do railway running and mining and some other things better than could private interests. We don't think so now. The war has cured us. The other day, when the railwaymen, who are a very high type of workers, demanded nationalisation of the American railways, they were met by a storm of protest from all classes, workmen included. We are afraid of bureaucracy and red tape and taxation to make up for losses due to the stupidity of political administration of public utilities. We are coming back to the good old British doctrine that the less interference from Government in industry the better. The best government is self-government. One of the greatest delusions that ever darkened the mind of man is the theory that you can work the institutions of industry by means of a political machine.

"A mineowner is simply a trustee and servant of the nation. A mine worker is exactly the same. Every business is a social service, otherwise its profits are got by fraud. Every worker is a national servant, otherwise he has no right to demand wages from the nation for his work. A coalminer will risk his life without a moment's hesitation to rescue a drowning child from the river; but the same child may die of pneumonia this winter because the same miner for some inscrutable reason is permitted by his union to work only a few hours a day. This theory and this practice really have nothing to do with the needs, rights, or wrongs of the worker. They are the expression of a wild revolutionary purpose, which has its source outside England, to destroy the so-called capitalistic system by reducing hours and output to a minimum and increasing wages to a maximum.

Patent Office Examiners

The Civil Service Commissioners announce that an examination will begin on October 28th next for the purpose of filling vacancies as assistant examiners in the Patent Office. The examination will be confined in the main to candidates who have served in His Majesty's Forces, and will consist of a qualifying examination followed by interview by a Selection Board. The subjects of the qualifying examination are English composition, *précis* writing, general knowledge, and one of the following: General chemistry, electricity and magnetism, mechanics and mechanism. The limits of age are twenty to thirty. Initial salary £150 a year, together with a war bonus. Copies of the regulations and forms of application may be obtained on application to the Secretary, Civil Service Commission, Burlington Gardens, London, W. 1. The last day for making application is September 18th.

Company News

ANGLO-MALAY RUBBER CO.—Interim dividend of 15 per cent, (actual), against 10 per cent. in respect of the year ending December 31, payable on October 15.

BLACK SEA AMALGAMATED OILFIELDS, LTD.—The financial position at June 1 last showed a surplus of Rs. 3,551,493. The production of the company for the six months ended June 30, 1919, was 516,646 poods (8,333 tons).

BRITISH ALUMINIUM CO.—The directors have declared interim dividends for the half-year to June 30 last at the rate of 6 per cent. per annum on the Preference shares, and at the rate of 8 per cent. per annum on the Ordinary, both payable, less tax, on October 1.

BUKIT SELANGOR RUBBER ESTATES.—The report for year to March 31 last shows a profit on working of £13,209, to which has to be added revenue from interest and transfer fees, £355, making £13,564. After payment of debenture interest and the administration expenses, there remains, including £1,273 brought in, a sum of £12,707 to be dealt with. The directors have written off for depreciation, £1,000; have placed to reserve, £3,500; and recommend a dividend of 7½ per cent. for the year, carrying forward £2,462.

CALICO PRINTERS' ASSOCIATION.—Owing to the fact that the directors have still been unable to arrive at a settlement with the Inland Revenue authorities in respect of the liability for excess profits duty, they are not yet in a position to submit the accounts for the year ended June 30. The dividend of 5 per cent. for the year on the Ordinary shares will be paid on September 30.

CAUCASIAN (TCHERMOEFF) OILFIELDS.—At the fourth annual general meeting of the Caucasian (Tchermoeff) Oilfields, Ltd., Sir Frederick Mitchell Hodgson, presiding, said that direct communication with the property had not been possible during the year. General Tchermoeff reported that in November, 1917, during the Bolshevist Revolution, the Grozny new oilfields were destroyed, the derricks burnt down, and the machinery and stores stolen. A claim had been made for compensation to the British Government, but in case that was overlooked he thought the company would obtain sufficient funds to enable it to go on drilling on what was undoubtedly a proved oilfield.

G. & J. MACLACHLAN.—For the year to March 31, 1918, the director of G. & J. Maclachlan, distillers, brewers and wine and spirit merchants of Glasgow, transferred £20,000 from the reserve to make up the available total to £114,200, out of which a dividend and bonus of 12½ per cent., free of tax, were declared; and £26,606 was carried forward. For the past year the profit was £86,487 and the available balance £113,093, or only slightly less than a year ago. After paying the Preference dividend, it is proposed to carry forward £89,093.

HARRISONS & CROSFIELD.—The directors have declared a dividend on the cumulative Preference shares at the rate of 6 per cent. per annum for the three months ending September 30, 1919, less tax at 6s. in the £.

MALAYAN TIN DREDGING.—Interim dividend of 5 per cent., same as a year ago.

MUNTZ'S METAL.—Interim dividend for half-year at rate of 5 per cent per annum (6d. per share), less tax, on Ordinary, payable October 1.

MERGUI CROWN RUBBER ESTATES—Net profit for the year (after allowing for full depreciation and interest on the premium on lease due to the Government of India), was £14,962, which, with the balance from last year (£9,388), made £24,350, less deducted for reserve for premium on lease (£3,000), leaving £21,350. Two interim dividends of 7½ per cent. each have been paid, and the directors recommend a dividend of 5 per cent., making 20 per cent. for the year, carrying forward £4,850, subject to the payment on account of premium on lease and adjustment of excess profits duty.

PEARSON & KNOWLES COAL AND IRON CO.—Dividend of 6½ per cent. on the Ordinary shares (including bonus and new issue), making 10 per cent. for the year, less tax; also a bonus of 5 per cent., free of tax; £50,000 to reserve; capital expenditure and the costs in connection with the new issue and capital distribution is to be written off out of profits. A year ago the dividend was 6s. 6d. per share, less tax, with a bonus of 5s., tax free.

SIR W. G. ARMSTRONG, WHITWORTH & CO.—Interim dividend on the Ordinary Shares of the company of 1s. per share, free of tax, up to an amount of 5s. in the £.

YORKSHIRE DYEWARE AND CHEMICAL CO.—The trading profits of the Yorkshire Dyeware and Chemical Co. for the year ended June 30 were £59,216, and £6,451 was brought forward. Debenture interest absorbed £3,591, and a final dividend of 5 per cent. and a bonus of 25 per cent. are proposed, making 35 per cent. for the twelve months, adding £15,000 to the reserve, and £20,000 to the extensions fund, and carrying forward £8,701. The board recommend that the share capital be raised to £150,000 by the capitalisation of £75,000 of the reserve fund, and that one new 15s. share be added to every similar share now held. The company's trading profits for 1917-18 were £46,351; for 1916-17, £57,956; and for 1915-16, £54,002; and distributions for each period were similar to those proposed for the past year. Twelve months ago £25,000 was reserved; in 1917, £30,000; and in 1916, £29,000.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Sept. 3.	Sept. 10.
Alby United Carbide Factories, Lim., Ord.	13/16–16/16	29/32–29/32
Associated Portland Cement Manufrs. (1900.) Lim., Ord.	9⅜–9⅝	9–9¼
Bell's United Asbestos Co., Lim., Ord.	2 1/16–2 3/16	2 1/16–2 1/16
Bleachers' Association, Lim., Ord.	1 13/32–1 15/32	1 1/2–1 5/16
Borax Consolidated, Lim., Prefd. Ord.	4½–5	4½–5
Bradford Dyers' Assoc. Lim., Ord.	2 3/16–2 5/16 xd	2 1/4–2 3/8 xd
British Aluminium Co., Lim., Ord.	1 9/16–1 11/16	1 13/32–1 15/32
British Oil and Cake Mills, Lim., Ord.	2 7/32–2 9/32 xd	2 1/4–2 5/16
British Portland Cement Manufrs., Lim., Ord.	33/6–35/6	33/0–35/0
Brunner, Mond & Co., Lim., Ord.	40/6–41/6	40/6–41/6
Castner-Kellner Alkali Co., Lim.	2⅜–2⅝	2⅜–2⅝
China Clay Corporation, Lim., Ord.	¼–⅜	¼–⅜
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.	57–61	57–61
Courtaulds, Lim.	10¼–10⅜	10–10½
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce.	⅞–1⅛	15/16–1 1/16
Curtis's & Harvey, Lim.	2 9/16–2 13/16	2 9/16–2 13/16
Electro Bleach and By-Products, Ltd., 7% Pref.	.. ..	xd
Explosives Trades, Lim., Ord.	20/9–21/9	20/6–21/6
Field (J. C & J.), Lim., Ord.	7/16–9/16	7/16–9/16
Greenwich Inlaid Linoleum (Fredk Walton's New Patents) Co., Lim., Ord.	½–⅝	½–⅝
Harrisons & Crosfield, Lim., 10% Cum. Prefd. Ord.	1 31/32–1 15/32	1 31/32–1 15/32
India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.	16½–17½	16½–17½
Lawes' Chemical Manure Co., Lim., Ord.	6–6½	5⅝–6½
Lever Bros., Lim., 6 % Cum. "A" Pref.	19/7½–20/1½	19/7½–20/1½
Do. 6½ % Cum. "B" Pref.	19/10½–20/4½	19/10½–20/4½
Magadi Soda Co., Lim., Ord.	1 1/16–1 1/16	1 1/32–1 3/32
Manganese Bronze and Brass Co., Lim., Ord.	11/16–13/16	11/16–13/16
Maypole Dairy Co., Lim., Defd. Ord.	27/32–29/32	27/32–29/32
Mond Nickel Co., Lim., 7% Cum. Pref.	1–1⅛	1–1⅛
Do. 7% Non. Cum. Pref.	15/16–1 1/16	15/16–1 1/16
Pacific Phosphate Co., Lim., Ord.	5⅛–5⅜	5–5¼
Power-Gas Corporation, Lim., Ord.	⅜–⅞	⅜–⅞
Price's Patent Candle Co., Lim.	50–53	70–80
Salt Union, Lim., Ord.	1 13/32–1 17/32	1⅜–1½
United Alkali Co., Lim., Ord.	1¼–1½	1¼–1½
Val de Travers Asphalte Paving Co., Lim.	31/32–1 3/32	31/32–1 3/32
Van den Berghs, Lim., Ord.	3 7/16–3 11/16	3 7/16–3 11/16
Walkers, Parker & Co., Lim.	1 5/16–1 7/16	1 5/16–1 5/16
Welsbach Light Co., Lim.	2¼–2½	2⅛–2⅜

Gas, Iron, Coal and Steel

Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	37/6–38/6	37/6–38/6
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.	1¼–1⅜	1 1/16–1¼
Gas Light and Coke Co., Ordinary Stock (4% Stand.)	56–59	58–61
Hadfield's, Limited, Ordinary	39/6–40/6	39/6–40/6
South Metropolitan Gas Co., Ordinary (4% Stand.)	57–60	59–62
Staveley Coal & Iron Co., Lim., Ord.	1 13/16–1 15/16	1 13/16–1 15/16
Vickers, Limited, Ordinary	36/0–37/0	35/6–36/6

Mines, Nitrate, &c.

Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	13–14	13–14
Antofagasta Nitrate Co. Compania de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.	88–93	88–93
Lagunas Nitrate Co., Lim.	1–1¼	1–1¼
Rio Tinto Co., Lim., Ord. (Bearer)	54–56	54–55
Tarapaca and Tocopilla Nitrate Co., Lim.	14/0–15/0	14/0–16/0

Oil and Rubber

Anglo-Java Rubber & Produce Co., Lim.	7/9–8/3	7/3–8/9
Anglo Maikop Corporation, Ltd., Ord.	5/0–6/0	5/0–6/0
Anglo-Malay Rubber Co., Lim.	14/7½–15/1½	14/7½–15/1½
Anglo-Persian Oil Co., Lim., Cum. 6 % Part	1 9/32–1 11/32	1 9/32–1 11/32
Burmah Oil Co. Ltd., Ord.	13 7/16–13 11/16	13 7/16–14 1/16
Chersonese (F.M.S.) Estates, Lim.	4/1½–4/4½	4/1½–4/4½
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	8 31/32–8 7/32	8 23/32–8 25/32
"Shell" Transport and Trading Co., Lim., Ord.	8 7/16–8 9/16	8 7/8–9
Do. 5% Cum. Pref.	9⅜–9⅝	9⅜–9⅝

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE

Notice of Intended Dividend

TAYLOR, HENRY FINNEY, Glebe House, Carsington, Derbyshire, and trading at the Hopton Bone Works, Wirksworth, Derbyshire, bone manure manufacturer. September 27. Trustee, E. W. Humphreys, Official Receiver, 4, Castle Place, Park Street, Nottingham.

Liquidators' Notices

THE KINGSTHORPE LEATHER MANUFACTURING CO., LTD.—A meeting of creditors will be held at the offices of Messrs. A. C. Palmer & Co., St. Giles' Chambers, Northampton, on Wednesday, September 10, at noon. H. Claude Palmer, Liquidator.

THE KISMET FILM CO., LTD. (In Liquidation).—A general meeting of members will be held at 444, Strand, London, W.C., on Friday, October 10, at 2 p.m. Charles Reed, Liquidator.

THE AFRICAN OILFIELDS SYNDICATE, LTD. (in Voluntary Liquidation).—A meeting of creditors will be held at 10, Coleman Street, London, E.C., on Monday, September 15, at 2.30 p.m. C. O. Hooper, one of the Liquidators.

Companies Winding up Voluntarily

THE COPAL VARNISH CO., LTD.—Mr. Joseph Stanley Walker, 41, Jermyn-street, London, S.W., appointed liquidator.

RUSSIAN PETROLEUM CO., LTD.—Mr. Ernest Willie Lowe, Pinners Hall, Austin Friars, London, E.C., appointed Liquidator. A meeting of creditors will be held at Pinners Hall, Austin Friars, London, E.C.2, on Monday, September 22, at 2.30 p.m.

BAKU RUSSIAN PETROLEUM CO (1909), LTD.—Mr. James William Creasser, 48, Cannon Street, London, E.C., appointed liquidator.

MARUDU RUBBER, LTD. (Winding up voluntarily for reconstruction purposes).—Mr. Hugh Crawford Dowling appointed liquidator.

BRITISH LION FILMS, LTD.—Mr. Arthur Francis Sharp, of Hilton, Sharp & Clarke, Inc. Accountants, Imperial Buildings, Ludgate Circus, London, appointed liquidator.

EUROPEAN OILFIELDS CORPORATION, LTD.—Mr Harold William West, Worcester House, Walbrook, London, E.C. 4, appointed liquidator. A meeting of creditors will be held on Thursday, September 18, at 12 noon, at Worcester House, Walbrook, London.

THE PREMIER OIL AND PIPE LINE CO., LTD. (Winding up voluntarily for reconstruction purposes).—Mr. Harold John de Courcy Moore appointed liquidator.

LAWSPER BLEACHING CO., LTD.—Mr. Frederick Selby Burman, 29, Princess Street, Manchester, C.A., appointed liquidator. A meeting of creditors will be held at 29, Princess Street, Manchester, on Tuesday, September 16, at 2.30 p.m.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

TEMPLETON DINAS SILICA BRICK AND CEMENT CO., LTD., TEMPLETON, near Narberth.—Registered August 27, £1,000 debentures, to D. Thomas, 8, Wind Street, Neath, and another; general charge. *£1,000. January 9, 1919.

Satisfaction

TEMPLETON DINAS SILICA BRICK AND CEMENT CO., LTD., TEMPLETON, near Narberth.—Satisfaction reg. Aug. 27, £1,006, reg. Nov. 8, 1902.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117 Chancery Lane, London, W.C.:—

ELEL, LTD.—Manufacturers chemists. Nominal Capital, £2,000 in 2,000 shares of £1 each. Directors to be appointed by Subscribers. Qualification of Directors, one share. Subscribers: H. Yorke, 94, East Street S.E. 17; Ida Yorke, 94 East Street, S.E. 17.

CAIRNS TORQUAY FILM CO., LTD., 8, Strand, Torquay.—To acquire at Watcombe, near Torquay a freeho'd residence with land for the purpose of a studio for the production of films and pictures. Nominal Capital, £50,000 in 50,000 shares of £1 each. Minimum subscription 14,000 shares. Directors: D. Cairns, 8, Knaresborough Place, S.W. 5; W. W. Cox, "Kimbrae" Chelston, Torquay; G. H. Iredale, "St. Clare," Torquay; C. McClellan, "Myott," 3A, Strand, Torquay; J. Kenny, "Heyford," Paignton; F. Pederzole, "Franconville," 6, Grand Avenue, Muswell Hill, N. Qualification of directors, £500. Remuneration of directors, £150 each.

BRITISH IRON MANUFACTURERS' RESEARCH ASSOCIATION. Atlantic Chambers, Brazenose Street, Manchester.—To promote research and other scientific work in connection with the trade or industry of manufacturing or preparing malleable wrought iron. Every member to contribute a sum not exceeding £10, if necessary. Directors: A. B Baylis, The Midland Iron Co., Ltd., Midland Iron Works, Rotherham, Yorkshire; J. J. Bleckly, Pearson & Knowles, Coal & Iron Co., Ltd. Warrington; J. B. Harding, Robert Heath & Sons, Ltd., Biddulph Valley Coal & Iron Works, Stoke-on-Trent; and four others.

PENDLETON OIL & CHEMICAL CO., LTD., 5, Lower Gold Street, Pendleton, Salford.—Chemical manufacturers and oil extractors. Nominal Capital, £3,000 in 3,000 shares of £1 each. Directors: J. E. Barber (Managing Director); H A. B. Robinson (Commercial Manager). Qualification of directors, 100 shares. Governing directors, 250 shares. Remuneration of directors, £208 Commercial Manager; £416 Managing Director.

APEX (TRINIDAD) OILFIELDS, LTD.—To acquire petroleum or oil-bearing lands and turn same to account. Nominal Capital, £200,000 in 200,000 shares of £1 each. Minimum subscription, seven shares. Directors: Sir J. Andersor, 5, Whittington Avenue, E.C. 3; G. R. Airth, 208–224, Salisbury House, Finsbury Circus, E.C. 2; W. H. Clark, 208–224, Salisbury House, Finsbury Circus, E.C. 2; W. Maclachlan, 65, London Wall, E.C. Qualification of directors, 250 shares. Remuneration of directors, £200 each; Chairman £250.

DOMESTIC SCIENCE WARES CO., LTD.—To carry on the business of manufacturing soap, polish, paint, oil, varnish, &c. Nominal Capital, £1,000 in 1,000 Ordinary shares of £1 each. Directors: E. H. Pullan, 133, Park Avenue, Wibsey, Bradford; H. S. Somers, 9, Upper Rushton Road, Bradford; H. M. Pullan, 133, Park Avenue, Wibsey, Bradford. Qualification of directors, £100.

HENRY MARRIOTT & CO., LTD., 45, Chorlton Street, Manchester. Dyers, bleachers, &c. Nominal Capital, £50,000 in 35,000 Ordinary shares, and 15,000 6½ per cent. Pref rence of £1 each. Directors: A. H Harrison, Moorcot, Leicester Road, Hale; H B Harrison, Moorcot Leicester Road, Hale; A H Trenbuth, 10, Aughton Road, Southport; C. L. Jones, 48, Campbell Road, Longsight, Manchester. Qualification of Directors, £1,000.

DICKINSON, WARD & CO., LTD.—Sugar merchants and refiners, &c. Nominal Capital, £2,000 in 400 shares Ordinary of £5 each. Directors: W Wilcock, Larkfield, Whitby (Managing Director); J. J. B. Barnard, Whitby; W. Ward, High Street, Sherburn-in-Elmet. Qualification of directors, £10.

ANGLO-CARIBBEAN PETROLEUM SYNDICATE, LTD., 13, Copthall Court, E.C. 2.—Oil producers and oil well proprietors and refiners. Nominal Capital, £25,000 in 25,000 shares of £1 each. Directors: W. F. Carstens, T. L. Gilmour, W. B. Mitford. Qualification of Directors, £100.

HENZELL OIL CO., LTD., Forth Banks, Newcast e-on-Tyne.—Oil refiners. Nominal Capital, £20,000 in 50,000 shares of £1 each. Directors: R. Henzell, West Hills, Rothbury, Northumberland (Managing Director). Qualification of Directors, 500 shares. Remuneration of Directors, £1,000 Managing Director.

The Maikop Oilfields

THE following information in reference to companies of the Anglo-Maikop group has been furnished to the boards by the Russian general manager, who has recently arrived in London:—

MAIKOP COMBINE, LTD.—The financial position at June 1, 1919, showed a surplus of Rs. 9,646,479. This is independent of the deposit held in the name of the nominees of the debenture-holders. Since the meeting of shareholders in March, 1919, the debenture debt has been reduced from £18,886 to £11,302. The production for the six months ended June 30, 1919, amounted to 1,047,258 poods (16,891 tons).

MAIKOP PIRELINE AND TRANSPORT CO., LTD.—The financial position at June 1, 1919 (old style), showed a surplus of Rs. 2,364,332. The company's deliveries to the Ekaterinodar refinery during the six months ended June 30, 1919, amounted to 1,316,875 poods (21,239 tons) of crude oil.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Switzerland (Bâle)	Chemicals	625
Canada (Toronto)	Dyes, glue, enamel, &c.	595
Canada (Waipawa)	Glass	597
Canada	Marine lamp lenses. Replies to Canadian Govt. Trade Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C. 2	
Malta	Glassware	603
Mauritius.. ..	Glassware	604
Italy (Genoa) ..	Hides and skins, palm oil	615

Contracts Open

Poplar.—Basic slag, sulphate of ammonia, superphosphates. Particulars from H. E. Dennis, Clerk, Guardians' Offices, Poplar, E. 14. Tenders by 6.30, September 17.

Fakenham.—Disinfectants. Particulars from Mr. W. O. Humphrey, Norwich Street, Fakenham, or Mr. R. S. Butcher, Clerk, Fakenham, Norfolk.

Bombay.—Tar for the Municipality of Bengal, 120,000 gallons required: 60,000 gallons to fulfil the requirements of the British Standard Specification No. 1, and 60,000 gallons to the British Standard Specification No. 2; to be delivered f.o.b. at an approved port. Particulars from the offices of Sir John Wolfe Barry, Lyster & Partners, Dartmouth House, 2, Queen Anne's Gate, Westminster, London, S.W. 1. Tenders by noon, September 5.

Edmonton.—Portland cement, oils, tallow, disinfectants, &c. Particulars from the office of the Engineer, Town Hall, Edmonton. Tenders by 12 noon, September 15.

Hampstead.—Soap, oilman's goods. Particulars from Mr. H. W. Preston, New End, Hampstead. Tenders by September 17.

London, S.W.—Soap. Particulars from the Steward, St. Thomas's Hospital, Westminster Bridge. Tenders by 11 a.m., September 15.

Glasgow.—Oils. Particulars from Mr. J. Ford, 19, Hope Street, Glasgow. Tenders by September 20.

Margate.—Soap, soda. Particulars from Mr. F. H. Madden, 93, Cannon Street, E.C. 4.

Work in Prospect

Burnley.—Plans have been approved for extensions and improvements to the dyeworks of H. Greenhalgh & Co.

Littleborough.—New works are to be built at Littleborough, near Rochdale, by Potters' Asbestos Co., Ltd.

York.—Plans have been approved for a spirit depot in St. James Street, for the British Petroleum Co., Ltd.

Llanelly.—An agreement has been entered into between the Reliance Fuel Co., Ltd., and the Llanelly Harbour Trust whereby the former will purchase three acres of land from the Trust on which to build works for the manufacture of briquettes and smokeless fuel.

A steam wagon laden with four tons of celluloid, caught fire at Warrington, blocking the main road between Liverpool and Manchester, suspending the tramway service, and interrupting telephones. The flames rose 30 feet.

There was a considerable drop last month in the estimated cost of the principal fire losses in the United Kingdom. The total may be estimated at £366,700, which compares with losses of £576,800 in July last. Only fires are included in the calculation, in which the damage amounted to £1,000 or more.

Research Associations

The Glass Research Association, established in accordance with the Government's scheme for encouraging industrial research, has been licensed by the Board of Trade as a company not trading for profit. The secretary is Mr. E. Meigh, 7, Seamore Place, W.1. The Department of Scientific and Industrial Research have approved the Memorandum and Articles of the British Refractories Research Association, which are now under consideration by the Board of Trade. Mr. A. C. Rann, 14, Great George Street, Westminster, S.W.1, will act as secretary of the Association.

Foreigners in France

A Bill at present before the Chamber of Deputies lays down certain rules and regulations with regard to the domicile of foreigners in France, and provision is made by the Bill for "cartes d'identité," declarations, etc. In accordance with the Bill, the *Board of Trade Journal* states, foreigners can only exercise the following professions after having obtained the requisite authority from the Government:—Customs and transport agencies, emigration and transit agencies for foreign workers in France, employment agencies, manufacture of war material and chemical products necessary for national defence, exploitation of mines, hotels and cafés.

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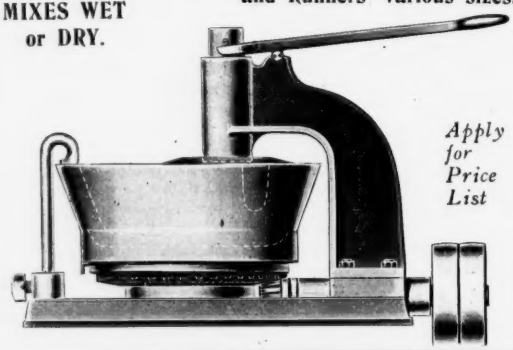

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